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## The Impact of Art:

Exploring the Social-Psychological Pathways That Connect Audiences to Live Performances

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### Abstract

Group growth is of fundamental importance to understanding social influence. How do passive bystanders become psychologically involved when observing a small group of actors? Our hypothesis was that the kind of solidarity displayed by the group shapes the bonds that emerge with an audience. We studied audience responses to modern dance performances conducted two field experiments and one lab experiment ( $N = 263, 363$  and  $147$ ). Performances were developed jointly with choreographers: dancers acted as an aggregate of individuals or displayed mechanical or organic solidarity. As predicted, the emergent bond between audience members and dancers was influenced by the kind of solidarity on display. When dancers displayed mechanical solidarity, the emergence of bonds was mainly predicted by perceived unity. When organic solidarity was displayed, the individual value of each dancer played a key role. Interestingly, overall artistic evaluation was affected in parallel with the development of bonds: the kind of solidarity displayed influenced performance evaluation. Finally, Experiment 2b showed that solidarity displayed on stage influenced the post-performance cooperative behaviour among audience members. The paper discusses the social psychological pathways by which performing arts influence communities and society.

*Keywords:* Mechanical solidarity, Organic solidarity, Group formation, Dance, Coordinated Action

## Introduction

Group development and socialization has been studied almost exclusively in small interactive groups (Arrow, McGrath, & Berdahl, 2000; Moreland & Levine, 1982; Tuckman & Jensen, 1977). But in many situations people can also develop bonds with groups they are not actively part of. Humans tune in to social interactions in their immediate environment, and sometimes appear to internalize them. When people listen to a staged debate or a conversation among strangers, in their minds they may be drawn in and, in some sense, enter the dialogue. Such vicarious participation is notable in sitcoms and talk shows that appear to be designed to elicit audience identification (Giles, 2002), but it can also occur in dance or music performances which evoke an emotional and/or physical connection (Beeman, 1993; Spencer, 1985). Audiences may identify with the performers or experience a sense of captivation. Even if this does not lead to active participation (clapping, shouting, dancing, or singing along), “bystanders” and “audiences” can vicariously develop a sense of psychological unity with the performers.

The phenomenon of an emergent psychological bond between audience members and performers has some parallels with processes in group formation. Decades of research has studied how active participation in small group processes contributes to members’ feeling like a group. But the question of how small, interactive groups grow and extend beyond the (physical) constraints of their active members, has not, to our knowledge, been studied yet. As elaborated below, studying the relationships that emerge between audience members and performers can shed new light on processes of group growth. Building on recent insights from research on group formation (Koudenburg, Postmes, & Gordijn, 2017; Postmes, Haslam, & Swaab, 2005), the present paper proposes that due to vicarious participation of audience members, processes of group formation may explain how bonds between audience members and actors develop. In two experimental field studies and one lab study, we investigate how

audiences respond (psychologically and behaviourally) to a target group who expresses solidarity through movement on stage.

We investigate the emergence of bonds between actors and audience members during dance performances in a theatre setting. One of the main reasons for focusing on the medium of dance is that this art form is universal across time and cultures, and has important community functions. This suggests that dance may be an ideal medium to forge social bonds between audience and performers.

### **Cooperation, group formation and the emergence of solidarity**

The core proposal of this paper is that the development of a bond between audience members and performers can be understood as a process of *group formation*. Because audience members can vicariously participate in the interaction, the same processes we know from the small group literature on group formation can be applied to the formation of bonds between a ‘passive’ audience and a group of actors. In this research, we build on research of group formation in small interactive groups (Koudenburg, Postmes, & Gordijn, 2013; 2017; Koudenburg, Postmes, Gordijn, & Van Mourik Broekman, 2015; Van Mourik Broekman, Gordijn, Koudenburg, & Postmes, 2018). In this work, we use the term solidarity to refer to three distinct but correlated indicators of “we-ness” that reflect perceived unity at the collective level (entitativity), bonds at the individual/interpersonal level (belonging and acceptance) and ties of group members to the group (identification). Solidarity refers to all three: not to obscure the differences between them, but to reflect the empirical reality that in small group formation, these three develop in tandem (see Koudenburg et al., 2017).

Our starting point is the interactive model of identity formation (Postmes et al., 2005; Postmes, Spears, Lee, & Novak, 2005). This model integrates knowledge about the interactive dynamics of small groups and the social identity dynamics of larger social categories. The model proposes both play a role in group formation: solidarity can develop via two non-

exclusive pathways, bottom-up and top-down. Bottom-up, a social identity can be constructed or negotiated through *organic* interactions between individuals. Top-down, a social identity can be *mechanically* deduced from similarities or from group level comparisons with relevant out-groups (e.g., Jans, Postmes, & Van der Zee, 2012; Meeussen, Delvaux, & Phalet, 2014; Koudenburg et al., 2015; Swaab, Postmes, & Spears, 2008).

In groups that are formed through a mechanical top-down processes, it is not necessary to form a personal relationship with each member of the group. Merely conforming to the group norms, shared cognitions, emotions or behaviour, or emphasising other commonalities is sufficient to self-categorize or identify with the group (e.g. Swaab, Postmes, Van Beest, & Spears, 2007; Livingstone, Spears, Manstead, Bruder, & Shepherd, 2011). As a result, group behaviour is characterized by uniformity (Durkheim, 1984) and indeed similarities (homophily) can promote group formation (e.g., McPherson, Smith-Lovin, & Cook, 2001). When uniformity forms the basis of group formation, a shared identity is formed in which individual differences are less relevant or less attended to (Postmes & Spears, 1998; Hornsey, 2008; Reicher, Spears, & Postmes, 1995).

By contrast, in groups that are formed through organic processes, interpersonal relationships and interdependency are often the foundational (Gaertner, Iuzzini, Witt, & Oriña, 2006; Postmes, Spears, et al., 2005). Furthermore, in organic interactions each member has the opportunity to make unique and valuable contributions to the group or community (cf. Durkheim, 1984). This complementarity of distinctive personal contributions of individual members may strengthen the perceived unity of the group as a whole, making the whole more than the sum of its parts (Jans, Postmes, & Van der Zee, 2011; 2012; Koudenburg et al., 2015).

Both mechanical uniformity and organic complementarity can be achieved verbally or nonverbally (see Koudenburg et al., 2017, for a review). Particularly relevant for the present

paper is that coordinated physical actions promote social bonding (e.g., Beeman, 1993; Evans-Pritchard, 1928; Fischer, Callander, Reddish, & Bulbulia, 2013; Seeger in Ingold, 1994; Spencer, 1985; Xygalatas et al., 2013). Synchronisation of *uniform* movements can blur the distinction between self and other, and enhance rapport and affiliation (Hove & Risen, 2009; Marsh, Richardson, & Schmidt, 2009; Koudenburg et al., 2015; Vacharkulksemsuk & Fredrickson, 2012; Valdesolo & DeSteno, 2011) and facilitate cooperation (Reddish, Fischer, & Bulbulia, 2013; Valdesolo, Ouyang, & DeSteno, 2010; Wiltermuth & Heath, 2009). Due to uniform movement in groups, individuals can feel more positive and secure (Novelli, Drury, Reicher, & Stott, 2013; Páez, Rimé, Basabe, Włodarczyk, & Zumeta, 2015). Many forms of dance are based on this principle of uniform movement (e.g., line dancing, classical ballet).

Importantly, interaction partners can also *organically* coordinate their behaviour, for example when group member complement each other (cf. behavioural meshing; Bernieri & Rosenthal, 1991). This can be seen in ballroom dance, team sports, or cultural rituals, and is likely to have similar effects on social solidarity (Koudenburg et al., 2015). When people dance together, for instance, each may perform a distinct role but the joint movement forms a meaningful whole. According to our theoretical model the psychological pathway to unity should be very different in such organic cooperation.

A recent series of studies confirmed that organic and mechanical collaborations both stimulate the development of solidarity, but in very distinct ways (Koudenburg et al., 2015). Both forms of coordination (compared with a no-coordination control condition) lead members of newly formed small groups to score higher on indicators of solidarity. However, the relation of the individual to the group played a markedly different role. Organic and mechanical coordination both raise solidarity levels, but only the effects of organic coordination (vs. mechanical coordination) is statistically mediated by the perceived personal value of individual contributions (Koudenburg et al., 2015, Study 1, 4, and 5). Thus, group

members' personal contributions to the group are central in organic group formation. But in mechanical group formation the experience of individuality is secondary to the emergent sense of "us".

It is important to note the differences between the mechanical-organic distinction and the individualism-collectivism dimension in cross-cultural psychology (Green, Deschamps, & Páez, 2005; Hofstede, 1980; Singelis, Triandis, Bhawuk, & Gelfand, 1995; Triandis, & Gelfand, 1998). There are parallels, but a key distinction is that the individualism-collectivism dimension assumes that, at the individual end of the continuum, social solidarity would be low. Indeed, individualism is often associated with a breakdown of norms and basic trust (Durkheim, 1984; Featherstone & Deflem, 2003; Merton, 1938). At best, individualism allows independent individuals to pursue their own goals without interfering with each other in so doing (cf. Hui & Triandis', 1986, definition of individualism). In contrast, in organic group formation a sense of individuality is *positively* related with a strong sense of solidarity (for empirical evidence see Jans et al., 2011; Koudenburg et al., 2015).

The present research applies these insights to the question how passive bystanders become psychologically involved when observing a small group of actors. We propose that the same processes that contribute to the formation of a sense of solidarity *within* groups can explain why outsiders (audience members) can develop a sense of solidarity with performers. Accordingly, we propose that observing a performance that expresses organic or mechanical solidarity can foster feelings of solidarity with the target group. In this process, the personal contributions of target group members should only matter for the emergence of organic solidarity, not for mechanical solidarity.

### **Vicarious participation in groups and its consequences**

The present research assumes that audience members can, in a sense, become psychologically part of a small interactive group even if they do not actively participate. This



is not a mystical process, for it occurs in mundane settings such as watching a movie.

Through processes of identification with characters on screen, we are able to align our own emotions with theirs. Even though we know that the characters on screen are not real, we can easily put ourselves in their shoes (see e.g., Giles, 2002). These same processes can occur when watching other types of performances (e.g., a dance performance, a football match, or a collective ritual) and this can foster a sense of community in the spectators (e.g., Beeman, 1993; Von Scheve, Beyer, Ismer, Kozłowska, & Morawetz, 2013; Xygalatas, Konvalinka, Roepstorff, & Bulbulia, 2001).

The vicarious process itself is central to human learning and experience (Bandura, 1965; McCann & Pearlman, 1990). Observers tend to mirror a target's behaviour during an interaction—this facilitates understanding (Barsalou, Niedenthal, Barbey, & Ruppert, 2003; Hatfield, Cacioppo, & Rapson, 1994; Hawk, Fischer, & Van Kleef, 2011; Knapp, Hall, & Horgan, 2013). The consequences of vicarious participation can be witnessed in research that shows that mechanical group activities as described above are rousing and energizing to bystanders (also see Konvalinka et al., 2011; Novelli et al., 2013; Páez et al., 2015; Xygalatas et al., 2011). Furthermore, there is some evidence that uniformly acting groups are more likely to be perceived as an entity (Ip, Chiu, & Wan, 2006; Lakens, 2010; Lakens & Stel, 2011). Putting these different elements together, it appears possible that outsiders can become psychologically involved in the mechanical actions of a small group, resulting in a heightened sense of solidarity<sup>1</sup>.

If we turn to how audiences relate to small groups displaying organic solidarity, the same processes should operate. Through vicarious participation and its relational consequences, audience members may develop an organic sense of solidarity with the

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<sup>1</sup> Processes such as these may occur when this group is not explicitly categorized as an out-group. Out-group categorization may heighten observers' motivation to remain distinctive (e.g., Postmes et al., 2005), and may accordingly reduce vicarious participation.

performers. This has never been shown empirically and would be a major contribution to knowledge. Conceptually it would be a remarkable development: a small group acting organically could, through vicarious participation, unify audience members into a group with a heightened sense of solidarity that displays distinctly organic characteristics. The social structure of the larger community is thus modelled on the characteristics that the small group at its centre displays.

Confirming this hypothesis would show that small group dynamics can shape much larger social groups. This would be innovative and noteworthy because there is an implicit assumption that group formation depends either on interdependence and social interactions or on homophily and similarity. This means that organic group formation is only possible in small groups (Dunbar, 1993; Gaertner, Iuzzini, Witt, & Oriña, 2006; Hill & Dunbar, 2003; Postmes, Spears, et al., 2005; Swaab et al., 2008), whereas mechanical group formation occurs in larger social categories and networks (Postmes et al., 2005). If small groups displaying organic behaviour can indeed evoke solidarity in an audience (who do not normally think of themselves as a group), this shows that large groups can adopt at least some characteristics of small, interactive, groups. This raises the possibility that also in very large groups, individualism and collectivism are positively related and mutually reinforcing. This would be cause to reconsider some core assumptions about small interactive groups and large non-interactive ones (cf. Wilder & Simon, 1998).

### **Dance as a cultural expression of community**

Displays of solidarity are often embodied: group members infer the characteristics of their groups from the collaborations they engage in (Koudenburg et al., 2015; 2017). Thus, there were pragmatic reasons for collaborating with a dance company and with choreographers and dancers on how to express different forms of coordination in a small group. More importantly, there are conceptual reasons why dance is an exceptionally well-

suited medium to examine our hypothesis. Anthropological and sociological research has pointed out that dance, as an art form, has important cultural and community functions for the expression and enhancement of social relations (Beeman 1993; Evans-Pritchard, 1928). Moreover, dance appears to be universal across time and cultures (Brown, 1991; Spencer, 1985). We inferred from this that dance could be an ideal medium for investigating our questions concerning organic and mechanical solidarity. Moreover, dance can be a high-impact stimulus. And the theatre setting is a controlled environment with high ecological validity for research on audience involvement.

Studying the relationship between performers and audience members is also interesting from an artistic perspective. Performing arts can be thought-provoking or entertaining, but its social impact has, as far as we know, never been empirically tested. We believe that the artistic and the social evaluation of performance go hand in hand: how people evaluate art may not only be determined by its aesthetic qualities, but also by the social interpretation of what one perceives. As such, the social aspect of a performance can play a key role in the art experience and evaluation, leading to more positive evaluations when art displays solidarity (vs. no solidarity).

### **Overview of the research**

Putting the different elements together, prior research suggests that it is possible for groups to embody organic and mechanical solidarity, as well as act as an aggregate of individuals. Furthermore, observers should be able to interpret the different forms of solidarity that a group of dancers displays on stage and should experience solidarity in line with what is displayed. To test this, we conducted two field experiments and one lab experiment in which audiences watched dance performances (live or video recorded). In the dance performances, the behavioural patterns of the dancers reflected either organic solidarity, mechanical solidarity, or dancers moved as an aggregate of independent

individuals. We collaborated closely with choreographers in order to develop, and have experimental control over, the performances. Each performance was kept identical in terms of performers, music, light, costume, and length. We also tried to eliminate any confounds, by attempting to keep constant the amount of visual contact with the audience, facial expressions, the presence of overtly positive or negative gestures, and so on. We ensured that the dancers did not breach the so-called ‘fourth wall’ that separates audiences from performers: Audience members were forced to take a ‘passive’ role as observer and were unable to physically partake in the activities on stage.

The aim of the three experiments was, firstly, to explore whether the theories about group formation could be set in motion; i.e., could mechanical and organic solidarity be translated into dance so that audiences could distinguish the different behavioural patterns? The first set of hypotheses was related to audience *perceptions*: We hypothesized that audience members should be able to distinguish between dancers expressing solidarity compared to dancers expressing no solidarity (Hypothesis 1a). Furthermore, we hypothesized that audience members differentiate between the different types of solidarity because they perceive more personal value of individual dancers when observing organic solidarity compared to mechanical solidarity (Hypothesis 1b). The second set of hypotheses was related to *emerging bonds* between audience members and dancers: Here, we hypothesized that audience members experience more solidarity when they observe solidarity than when they observe individuals (Hypothesis 2a). Moreover, we expected that the process of experiencing solidarity differs depending on the solidarity observed; we hypothesized that perceptions of entitativity play a mediating role in the experience of mechanical solidarity (vs. aggregate of individuals), but that the experience of organic solidarity is mediated by both perceptions of entitativity *and* perceptions of personal value (Hypothesis 2b). The third set of hypotheses examined whether the solidarity experienced with the dancers would extend to feelings of

solidarity with fellow observers; i.e., would observing solidarity together influence the level and quality of solidarity among members of the audience? We hypothesized that observing solidarity, compared to individuals, would lead to increased solidarity (Experiment 1) and improved cooperation (Experiment 2b) among members of the audience (Hypothesis 3). Finally, we wanted to know whether the displayed and experienced solidarity shaped artistic evaluations of the performance. We hypothesized a more positive artistic evaluation after observing expressions of solidarity than after observing individuals (Hypothesis 4a). We also expected that for mechanical solidarity a positive artistic evaluation is mediated by perceptions of entitativity, whereas for organic solidarity it is mediated by perceptions of entitativity *as well as* perceptions of personal value (Hypothesis 4b).

## Experiment 1

### Method

**Participants.** Participants were 263 audience members (172 female, 89 male, 2 unknown,  $M_{age} = 39.21$ ,  $SD = 14.22$ ) who attended one of 12 dance performances across three days during a major performing arts festival in the Netherlands in 2013<sup>2</sup>. The festival attracts large and mixed audiences with visitors who regularly visit arts performances and many who rarely do so. There was a different performance for each experimental condition: visitors either saw dancers act as an aggregate of individuals ( $n = 84$ ), or display mechanical solidarity ( $n = 101$ ) or organic solidarity ( $n = 78$ ). Each day had four time slots, and performances were

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<sup>2</sup> We removed 8 participants who indicated that they had seen a previous performance and 8 participants < 16 years whose parents had not given consent. By Dutch law, people above 16 do not need parental consent. Two participants were removed because of missingness on key dependent variables. We checked for multivariate outliers by calculating Mahalanobis Distances (MD) on the 9 key dependent variables (cf. Tabachnick & Fidell, 2013). We used conventional statistical benchmarks for outlier detection ( $p < .001$ ) in combination with the distribution of MD in the sample and case-by-case inspection of extreme values. No cases exceeded the statistical threshold value and responses were not suspicious. Accordingly, no outliers were removed.

counterbalanced in a Latin-square type design so that they were displayed once in each time slot.

### **Procedure and materials.**

*Development of three choreographies.* In the week prior to the festival, we explained the theoretical concepts of different types of solidarity to five choreographers of dance company Random Collision. The choreographers received a written briefing that explained the theoretical concepts and the purpose of the experiment. Organic solidarity was described as a community in which ‘every individual contributes their own distinctive skills, actions, and personality’. Mechanical solidarity was described as a community in which ‘collective ideas of what the group is like (or should be like) shape actions of every individual’. An aggregate of individuals was described as ‘occasions in which a sense of community is irrelevant or absent’ and ‘although social interactions may be superficially maintained, underlying relationships are treated with indifference’<sup>3</sup>. Because we wanted the choreographers to develop the physical representations of the concept themselves, and we did not want to steer them in any direction, the briefing did not include examples related to physical movement, such as a marching army or line dancing.

Based on these instructions, the choreographers developed and performed three types of performances<sup>4</sup>, i.e., each performance had the same group of five dancers. Their goal was to translate the theoretical concepts into dance performances in which the interaction between the dancers conveyed organic or mechanical solidarity, or they behaved as an aggregate of individuals. The choreographers were instructed to make each performance approximately 10 minutes long and to vary only the expression of solidarity across conditions. The individuals condition was operationalized as follows; all five dancers in this condition performed their

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<sup>3</sup> The full briefing is included in the supplementary material.

<sup>4</sup> For an impression of the performances, see <https://vimeo.com/147571434> (password: ExperimentA).

own solo on stage. This meant that each dancer performed independently without ever making any sustained contact (with eyes or movement) with the others. This was intended to portray a highly individualized version of a community in which interactions (positive or negative) between individuals were avoided.

The development of the performances was left to the choreographers, but researchers did answer questions during the development process. The choreographers decided that because of the limited time frame they could not develop three choreographies. Instead, they developed a concept (essentially a method of interacting with one another on stage) within which they improvised during each performance. This meant that the four performances within one condition were never completely the same.

***Performances.*** The performance “Experiment A” was introduced as a dance performance as well as a scientific study. Participants were unaware of the fact that there were different performances. Audience members were informed that by taking part in the experiment they gave consent for their data to be used for scientific purposes. There was no entrance fee. Performances were held in a former church building with a 12 by 10 metres stage. The audience was seated approximately two metres from the stage, either on chairs or on large bean bags, on the same level as the dancers. Audience sizes were kept deliberately small (an average of 23) to make the administration of the questionnaires manageable. Both the performance and the audience were filmed. After the performance audience members filled in a questionnaire (either in Dutch or English depending on the participants’ preference). After finishing the questionnaire, the audience was verbally debriefed.

***Questionnaire.*** A 15-minute questionnaire was designed to measure several aspects of solidarity (belonging, identification, and entitativity, see also Koudenburg et al., 2015). Items were measured on 7-point scales (1 = strongly disagree, 7 = strongly agree). We present only the main dependent variables here; for the full questionnaire and analyses of secondary

variables see the supplementary materials. The questionnaire was developed before dance rehearsals took place: The dependent variables were developed independently of the choreographies.

*Perceived relations among dancers.* The questionnaire first assessed how the gestures of dancers towards each other were interpreted. Perceived unity among the dancers was assessed with two items of *perceived entitativity* (Jans et al., 2011; Lakens, 2010); ‘I feel the dancers are a unit’ and ‘I thought there was a sense of togetherness among the dancers’ (Cronbach’s  $\alpha = .87$ ).

We hypothesized that participants in the organic solidarity condition should perceive each dancer to be more personally valuable to the group than participants in the mechanical and individuals conditions. We therefore measured individual dancers’ perceived *personal value* to the performance (Koudenburg et al., 2015): ‘Each dancer fulfilled an important role in the performance’, ‘I believe each dancer was indispensable to the performance’, and ‘The performance would remain the same with one dancer less’ (reverse coded;  $\alpha = .65$ ).

Furthermore, we assessed whether participants thought that the dancers’ movements were *directed* by a choreography (as opposed to spontaneous or improvised). Even though in reality all performances were improvised, we reasoned that in the mechanical condition the dancers’ actions would appear to be restricted or constrained by a higher order structure. To assess this, we developed three items; ‘I think the performance is directed’, ‘It seemed as if the dancers were told what to do’, and ‘It seemed as if the dancers spontaneously made their own decisions’ (reverse coded,  $\alpha = .75$ ).

*Solidarity with the dancers.* Then, we measured sense of *belonging with the dancers* with three items from the Need Threat Scale (Van Beest & Williams, 2006); ‘During the performance I felt as one with the dancers’, ‘During the performance I felt connected with the dancers’, and ‘I felt like an outsider when I watched the performance’. Also, we measured



*identification with the dancers* with the item, ‘During the performance I identified with the dancers’ (Postmes, Haslam, & Jans, 2013). Because these scales were closely related (between scales:  $r = .65$ ) and because we wanted to reduce the number of dependent variables as much as possible, all items were collapsed in the analyses (total scale  $\alpha = .84$ ).

To measure whether participants *identified with all dancers equally*, two identification items were included; ‘During the performance there were some dancers I identified with more than other dancers’ (reverse coded) and ‘During the performance I identified with all dancers equally’ ( $\alpha = .69$ ).

*Solidarity with the audience.* We used similar items, slightly rephrased, to measure *belonging with the audience*, *identification with the audience*, and *entitativity within the audience* (e.g., ‘During the performance I experienced a sense of togetherness in the audience’). As before, these scales were closely related (average correlation between scales:  $r = .59$ ) and all items were therefore collapsed in the analyses (total scale  $\alpha = .89$ ).

*Solidarity between audience and dancers.* Next we measured the relationship between audience and dancers. This was also assessed with an *entitativity* measure with the additional item ‘I have the feeling that the audience and the dancers were as one during the performance’. Because we were also interested in the implicit distance between audience and dancers, we included a single pictorial measure of *closeness between dancers and audience* (cf. Schubert & Otten, 2002). A sequence of seven figures was shown, each consisting of two circles representing dancers and audience. In the sequence, the two circles were increasingly close until they are almost fully overlapped. Participants indicated which of the figures represented the closeness between the audience and the dancers. These scales were also closely related ( $r = .54$ ) and items were collapsed (total scale  $\alpha = .87$ ).

*Artistic evaluation.* Two items measured the evaluation of the performance indirectly by assessing the extent to which the performance evoked the audience’s *interest*: ‘Because of

this performance my interest in modern dance increased' and 'Because of this performance I am curious about other activities of Random Collision' ( $\alpha = .68$ ).

*Control variables.* We thought that participants' prior exposure to performing arts could affect their social and artistic evaluation of the performance. We therefore assessed how often participants had participated in cultural activities, visited dance performances, and visited modern dance performances (aggregated into one variable *cultural behaviour*;  $\alpha = .83$ ). As an additional check, participants indicated whether and to what extent they knew any one of the dancers on stage. Finally, participants listed their demographics (age, gender, and nationality), their ideas about the purpose of the study and any additional comments.

## Results

The means and standards deviations of all variables are reported in Table 1. For most variables, our a priori predictions focus on the difference between the individuals condition versus the two solidarity conditions and on the difference between the mechanical solidarity condition and the organic solidarity condition. These predictions are tested with two contrasts: Contrast 1 compared the individuals condition with the mechanical + organic conditions (individuals =  $-2/3$ , mechanical =  $1/3$ , organic =  $1/3$ ). Contrast 2 compared the mechanical condition with the organic condition (individuals = 0, mechanical =  $-1/2$ , organic =  $1/2$ ). For two variables, we expected either the mechanical condition or the organic condition to differ from the other two. There we used slightly different a priori contrasts which are explained below.

Participants watched the performance in a live audience. Audience members may have influenced each other: observations are not independent. We calculated Intraclass Correlation Coefficients (ICC1's) to determine the amount of variance explained by between-audience differences (Bliese, 2013). The ICC's ranged from 0.00 to 0.30 (median = 0.06). Because audiences are nested within conditions, these ICC values are inflated by any between-

condition differences. If we condition-mean center the data we get an unbiased estimate of between-audience ICC's. These range from 0.00 to 0.05 (median = 0.00).

Because the data are nested, we wanted to account for between-audience differences. We conducted multilevel analyses with the nlme-package in R (Pinheiro, Bates, DebRoy, Sarkar, & R Core Team, 2016). Because the total number of performances was small, it is good to note that all results reported below are corroborated in individual level analysis. We present random intercept models: in none of the analyses did random slopes increase the model fit (see supplementary materials for all model fit statistics). Effect sizes were calculated with the within group residual standard deviations (Tymms, 2004).

Checks showed that 18 participants knew at least one of the dancers. Excluding these 18 did not make a difference for the results and so we used the full dataset for the analyses reported here. In the model, participants' self-reported cultural behaviour was entered as a covariate. The effects of cultural behaviour are not reported, because there were no interactions between cultural behaviour and the independent variables and because we are not interested in the main effects of cultural behaviour.

**Perceived relations among dancers.** Confirming hypothesis (H1a), Contrast 1 showed a very large effect: in the two solidarity conditions participants perceived more entitativity among dancers than in the individuals condition,  $b = 1.77$ ,  $t(9) = 9.76$ ,  $p < .001$ , 95% CI [1.36, 2.17],  $d = 1.52$ . As predicted, there was no difference in entitativity between the organic and mechanical conditions,  $b = 0.01$ ,  $t(9) = 0.06$ ,  $p = .951$ , 95% CI [-0.45, 0.47],  $d = 0.01$  (see Figure 1)<sup>5</sup>.

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<sup>5</sup> In response to a reviewer, we have performed additional post hoc analysis to control for feelings and appraisal of pleasantness, ease, and comfort. These analyses revealed that the effect of perceived entitativity remain when controlling for feelings and appraisal of pleasantness respectively. The outcomes of these analyses from Experiment 1 can be found in the supplementary material, Table 4 and 5. In Experiment 3 we address the reviewer's concern in a more structured and controlled manner.

We expected the personal value of each dancer to be higher in the organic condition, than in the two other conditions. Therefore, for this analysis we defined different a priori contrasts: the key contrast compares the organic condition with the other two (individuals =  $-1/3$ , mechanical =  $-1/3$ , and organic =  $2/3$ ). The other was an orthogonal contrast that did not test an a priori hypothesis (individuals =  $1/2$ , mechanical =  $-1/2$ , and organic =  $0$ ). We found the predicted effect with a small effect size: Participants in the organic solidarity condition thought the dancers had more personal value to the group than participants in the individuals and mechanical conditions,  $b = 0.45$ ,  $t(9) = 2.45$ ,  $p = .037$ , 95% CI  $[0.04, 0.86]$ ,  $d = 0.39$ . The orthogonal contrast showed no effect,  $b = -0.17$ ,  $t(9) = -0.86$ ,  $p = .413$ , 95% CI  $[-0.62, 0.28]$ ,  $d = -0.15$ .

With respect to the extent to which audience members perceived the performance as directed, we expected that mechanical solidarity would be perceived as most directed (and least spontaneous) and that organic solidarity would be perceived least directed (most spontaneous). We again defined contrasts to test these predictions. One compared the mechanical condition with the other two (individuals =  $-1/3$ , mechanical =  $2/3$ , organic =  $-1/3$ ) and the other was an orthogonal contrast that did not test an a priori hypothesis (individuals =  $-1/2$ , mechanical =  $0$ , organic =  $1/2$ ). We found a medium-sized effect for the first contrast in line with the hypothesis: the mechanical performances were perceived as more directed than the other two conditions,  $b = 0.71$ ,  $t(9) = 4.09$ ,  $p = .003$ , 95% CI  $[0.32, 1.10]$ ,  $d = 0.61$ . The orthogonal contrast was not significant,  $b = -0.15$ ,  $t(9) = -0.68$ ,  $p = .515$ , 95% CI  $[-0.63, 0.34]$ ,  $d = -0.13$ .

**Solidarity with the dancers.** We expected that perceiving solidarity *among* the dancers would facilitate the audience's ability to experience solidarity *with* the dancers. We used the standard contrasts to test this. Supporting Hypothesis 2a, we found a small effect for the aggregated measure (see Figure 2). Participants in the solidarity conditions experienced

more solidarity with the dancers than participants in the individuals condition,  $b = 0.45$ ,  $t(9) = 2.40$ ,  $p = .040$ , 95% CI [0.03, 0.87],  $d = 0.38$ . As expected, no difference was found in the sense of solidarity between participants in the mechanical solidarity condition and participants in the organic solidarity condition,  $b = 0.23$ ,  $t(9) = 1.08$ ,  $p = .308$ , 95% CI [-0.25, 0.71],  $d = 0.20$ <sup>6</sup>.

Finally, when assessing identification with all dancers equally, a medium-sized effect was found in the hypothesized direction (H2a). In the solidarity conditions participants were more likely to identify with all dancers equally than in the individuals condition,  $b = 0.97$ ,  $t(9) = 4.44$ ,  $p = .002$ , 95% CI [0.48, 1.46],  $d = 0.76$ . Although we expected that observing organic solidarity would lead participants to differentiate more between the individuals in the dance group, and thus not necessarily identify with all dancers equally, we found no difference with respect to the level of identification in either condition,  $b = -0.05$ ,  $t(9) = -0.18$ ,  $p = .859$ , 95% CI [-0.60, 0.51],  $d = -0.04$ .

Interestingly, we found a negative correlation between identification with the dancers and identification with all dancers equally: the more one identified with the dancers the less one seemed to identify with each of the dancers equally,  $r = -.35$ ,  $p < .001$ <sup>7</sup>. This seems to indicate that these two variables measure something substantially different. Indeed, when one identifies with all dancers equally, it does not imply that one identifies highly with all dancers. When one identifies with all dancers equally it could also mean that one identifies equally low with all dancers. Therefore, the equal identification measure merely seems to suggest that in the solidarity conditions each dancer is socially evaluated more equally than in

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<sup>6</sup> Post hoc additional analyses revealed that the effect of solidarity was slightly less strong when controlling for feelings of pleasantness,  $b = 0.32$ ,  $t(9) = 1.80$ ,  $p = .10$ , CI [-0.08, .72], or appraisal of pleasantness,  $b = 0.30$ ,  $t(9) = 1.64$ ,  $p = .14$ , CI [-0.11, .71]. Although the effects are no longer significant at  $p < .05$ , the confidence intervals shifted only slightly, from which we infer that pleasantness was not a strong driver of the effects. For the full analyses, see Table 4 and 5 in the supplementary material.

<sup>7</sup> In the individuals condition this was  $r = -.35$ ,  $p = .001$ , in the mechanical condition  $r = -.43$ ,  $p < .001$ , and in the organic condition  $r = -.31$ ,  $p < .01$ .

the individuals condition. This corresponds with a perception of unity among the dancers in the solidarity conditions.

**Solidarity with the audience.** We also assess whether performances affected the solidarity with the audience itself (H3). There was no evidence for a difference across conditions (Contrast 1  $b = -0.10$ ,  $t(9) = -0.56$ ,  $p = .587$ , 95% CI  $[-0.53, 0.32]$ ,  $d = -0.09$ , and Contrast 2  $b = -0.26$ ,  $t(9) = -1.23$ ,  $p = .251$ , 95% CI  $[-0.74, 0.22]$ ,  $d = -0.22$ ).

**Solidarity between audience and dancers.** We assessed whether an overarching solidarity had emerged between audience and dancers as a result of the performances, i.e. whether participants perceived that the audience *as a whole* was more strongly related with the dancers. However, there were no effects (Contrast 1  $b = 0.15$ ,  $t(9) = 0.90$ ,  $p = .393$ , 95% CI  $[-0.22, 0.52]$ ,  $d = 0.13$ , and Contrast 2  $b = -0.12$ ,  $t(9) = -0.62$ ,  $p = .549$ , 95% CI  $[-0.54, 0.30]$ ,  $d = -0.11$ ).

**Artistic evaluation.** Finally, we examined whether the evoked interest of the performance differed between conditions. We found a medium-sized effect in the hypothesized direction (H4a, see Figure 2). Participants in the solidarity conditions became more interested in modern dance than participants in the individuals condition,  $b = 0.63$ ,  $t(9) = 3.46$ ,  $p = .007$ , 95% CI  $[0.22, 1.05]$ ,  $d = 0.54$ . There was no difference in interest between the mechanical and organic condition,  $b = 0.01$ ,  $t(9) = 0.07$ ,  $p = .945$ , 95% CI  $[-0.45, 0.48]$ ,  $d = 0.01$ .

**Mediation models.** We hypothesised that the interpretation of the relationship *between* dancers would mediate whether audience members themselves experienced solidarity with the dancers (Hypotheses 2b) *and* whether the performances evoked their interest (Hypotheses 4b). We re-analysed the effects reported above, zooming in on the specific comparisons needed to test the hypothesized mediation. In the mechanical condition (compared to the individuals condition) we expected perceptions of entitativity to mediate. In

the organic condition (vs. individuals) we expected that perceptions of entitativity and of personal value would *both* mediate. We tested this with “2-1-1” multilevel mediation models that distinguished within- and between-group effects of the mediators entitativity and personal value (Zhang, Zyphur, & Preacher, 2009). Condition effects were tested with dummies: D1 comparing mechanical solidarity vs. individuals (mechanical solidarity = 1, other conditions = 0), D2 comparing organic solidarity vs. individuals (organic solidarity = 1, other conditions = 0). Confidence intervals for the unbiased coefficients were bootstrapped with 1,000 samples using the *boot* library in R (Canty & Ripley, 2017; Davison & Hinkley, 1997).

The first model examines mediation for the relationship with the dancers (Figure 3). The analysis revealed that in the mechanical solidarity condition, compared to the individuals condition, experienced solidarity with the dancers was mediated by perceived entitativity (indirect effect  $ab = 0.303$  [0.066, 0.53]), but not by perceived personal value ( $ab = 0.135$  [-0.211, 0.605]). In contrast, in the organic solidarity (vs. individuals) condition, solidarity with the dancers was mediated by *both* perceived entitativity ( $ab = 0.302$  [0.061, 0.519]) as well as by perceived personal value ( $ab = 0.144$  [0.023, 0.305]).

For the mediation of evoked interest, we descriptively found the same pattern (Figure 4) but not all predicted effects were significant at  $\alpha=.05$  (two-sided). In the mechanical (vs. individuals) condition there was a tendency for evoked interest to be mediated by perceived entitativity ( $ab = 0.203$  [-0.041, 0.463], equivalent to  $p=.051$  in a one-sided test), but less so by perceived personal value ( $ab = 0.063$  [-0.062, 0.237], equivalent to  $p=.16$  one-sided). For the organic solidarity (vs. individuals) condition, evoked interest was mediated marginally by perceived entitativity ( $ab = 0.203$  [-0.044, 0.453]),  $p = .054$ , and significantly by perceived personal value ( $ab = 0.181$  [0.031, 0.369]).

## Discussion

All in all, the results of this experiment were promising. Results show that it was possible to develop choreographies which display relations that are experienced by the audience as predicted according to theories about group formation. Participants were able to distinguish between displays of solidarity and aggregates of individuals; they perceived more entitativity among the dancers when they observed mechanical or organic solidarity compared to when they observed individuals (Hypothesis 1a). Secondly, we wanted to determine whether participants experienced the two solidarity conditions differently. Indeed, in line with our hypotheses, participants believed that the individual dancers were more important to the group in the organic solidarity condition compared with the two other conditions (Hypothesis 1b). Moreover, participants in the mechanical solidarity condition believed the performance to be more directed. We believe that this perception of directedness was due to the audience experience that there was a top-down social structure that governed the movement of the dancers.

We also found that the nature of solidarity displayed on stage influenced the degree to which audience members experienced solidarity with the dancers. Participants in the organic and mechanical solidarity condition felt more belonging with the dancers compared to the participants in the individuals condition (Hypothesis 2a). However, we find no evidence for this pattern for identification with the dancers. Finally, the fact that participants in the solidarity conditions identify more equally with all the dancers compared to participants in the individuals condition suggests that the dancers are seen more as a unit in the solidarity conditions than in the individuals condition. Indeed, it suggests that participants in the individuals condition did not identify with the dancers as a group, although they may have identified with separate dancers individually.

The mediation analyses confirmed the hypothesis that the interpretation of the social relations displayed on stage mediated the effect of performances on felt solidarity with the



dancers (Hypothesis 2b) and there is some indication of a similar pattern of effects on evoked interest (Hypothesis 4b). In the mechanical performances, solidarity was evoked by perceiving the dancers as an entity. But in the organic performances, solidarity was also evoked by the value of individual contributions that each dancer was seen to make to the performance. This directly confirms that the audience's experience of the performance is mediated by the group processes displayed on stage. Moreover, this confirms that different group processes are at work in the mechanical and the organic performances.

So far there is considerable support for the hypotheses, but when we look at solidarity among the audience and the perceived solidarity between the audience *as a whole* and the dancers, there was no support whatsoever for the hypothesis (Hypothesis 3).

Thus, although the performances appear to have successfully manipulated the emergent relation between audience and dancers, there was no evidence that relationships among the audience itself was affected. We retrospectively reasoned that it may have been insufficient to ask the audience to report on their feelings of solidarity with the audience, in a questionnaire straight after the performance. After all, up to that point the audience has simply been watching the show—why should this change their relationship to one another? We speculated that if audience members could interact with one another after the performance, we might witness some impact of the performance on their social behaviour towards each other. We designed a second experiment that included two parts (here described as Experiment 2a and 2b) to address this issue. The main purpose of experiment (2a) was to replicate Experiment 1, while the second part of the same experiment (2b) focuses on the consequences for social behaviour among the audience.

## **Experiment 2**

### **Experiment 2a**

To test the robustness of the effects Experiment 2a was designed to replicate Experiment 1. Furthermore, the performances in Experiment 1 were mostly based on improvisation, making the performances within conditions slightly dissimilar. In order to solve this, we fully choreographed the performances in this experiment. Finally, we gave choreographers more time for development of the conditions, hoping that this would result in artistically more refined choreographies as well as better experimental control, all of which should result in larger effects.

## Method

**Participants.** We collected data at the same performing arts festival as in Experiment 1, one year later in 2014. Eight participants were removed because they were under-aged, nine more because of missingness on key variables. This left us with a sample of 363 participants who attended one of 12 performances (247 female, 112 male, 4 unknown;  $M_{age} = 38.85$ ,  $SD_{age} = 13.69$ ; 317 Dutch, 31 non-Dutch, 13 unknown). The design was the same as Experiment 1. Sample sizes differed somewhat across conditions: individuals ( $n = 104$ ), mechanical solidarity ( $n = 142$ ), and organic solidarity ( $n = 117$ )<sup>8</sup>.

### Procedure and materials.

**Development of the choreographies.** In this experiment, there was closer collaboration between researchers and choreographers. For artistic, practical, and time reasons we worked with three choreographers, each of whom was responsible for developing one condition. To keep between-condition differences limited, except for the type of solidarity displayed, the three choreographers worked closely with each other and with the researchers.

As in Experiment 1, the three choreographers were familiarized with the distinctions between conditions. Each choreographer developed a choreography of approximately 16 minutes, performed by the same four dancers. Lights, costumes, and music were held constant

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<sup>8</sup> We checked for outliers as in Experiment 1. No cases exceeded the statistical threshold value. Accordingly, no outliers were removed.

over the performances. The choreographers jointly explored different possibilities in a research week, and then each developed their own performance in approximately three weeks<sup>9</sup>. During this experiment, the individuals condition was operationalized slightly differently. Instead of not interacting with one another at all, the dancers did interact, but merely to their own advantage. Therefore, this was again a depiction of a highly individualized community, but one in which interactions were more instrumental rather than social.

***Performances.*** There were some small differences to the procedure compared with Experiment 1. The theatre floor was somewhat smaller: the stage was 7 X 7 meters. The front row was close to the stage, as in Experiment 1, but behind there were six rows of seats on an elevation. The size of the audience was larger than in Experiment 1: on average 31 participants per performance. Our expectation was that both audience size and theatre setting would increase the psychological distance between audience and dancers, making this a more conservative test of the hypotheses.

Unlike Experiment 1, participants bought tickets (€4.00) to see a performance (unaware that there were three different ones). Seats were unassigned. Immediately after the performance audience members filled in a short questionnaire (shortened for reasons of time, in Dutch or English). After filling this in, they were asked to move to an adjacent room for Experiment 2b. In this room the group carried out a task, which was introduced as a game called “reconstruction”. Subsequently the audience was debriefed and got the opportunity to ask questions.

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<sup>9</sup> For an impression of the performances, see <https://vimeo.com/147849401> (password: ExperimentB).

**Questionnaire.** The dependent variables were similar to Experiment 1, but the questionnaire was shortened<sup>10</sup>. The full questionnaire and descriptive statistics of secondary variables can be found in the supplementary materials. All scale items were measured on 7-point scales (strongly disagree to strongly agree).

*Perceived relations among dancers.* We measured *perceived entitativity* as in Experiment 1 ( $\alpha = .82$ ) and we included two of the original three items to measure dancers' *personal value* ( $r = .38, p < .001$ ). Dropping one item had the unfortunate consequence that in this sample the scale reliability was low ( $\alpha = .55$ ). Since both items showed broadly similar effects we collapsed them. The next study resolves the reliability issue.

*Solidarity with the dancers.* We included two items to measure *belonging with the dance group* from Study 1 (connection and exclusion) and the measure of *identification with the dance group*. These items were correlated highly and were collapsed ( $\alpha = .77$ ).

*Solidarity between audience and dancers.* Because the results of Experiment 1 failed to show any effects on these measures, we changed them. The new measure of *solidarity* between the audience as a whole and the dance group consisted of three items: 'I had the feeling that a bond developed between the audience and the dance group during the performance' (adapted from Leach et al., 2008), 'I had the feeling that the performance reduced the emotional distance between the audience and the dance group', and 'I experienced a sense of togetherness between the audience and the dance group during the performance' (adapted from Postmes, Brooke, & Jetten, 2008;  $\alpha = .84$ ).

*Artistic evaluation.* The measure of artistic evaluation consisted of the items measuring *evoked interest* used in Study 1 ( $\alpha = .77, r = .63$ ). We added items measuring the evaluation of the performance more directly: 'My overall evaluation of the performance is

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<sup>10</sup> There was a second questionnaire after Experiment 2b. We found no significant results for these data and therefore do not report the results. The descriptive statistics for these measures can be found in the supplementary material.

positive' and 'My overall evaluation of the performance is negative' (recoded). All items were correlated highly and were collapsed ( $\alpha = .88$ ). In addition, participants were asked in two open questions to describe, with a few keywords, what emotions the performance evoked and what they thought the performance was about.

*Control variables.* This time *cultural behaviour* was assessed with two items (participation in cultural activities and frequency of visiting modern dance performances, on a 7-point scale from never to often). We included a new measure to assess whether participants were involved with *dance* themselves ("Are you involved in dance?" with five tick boxes: as audience member, in a recreational context, an organised context, a professional context or not at all). Furthermore, participants were asked whether they had visited a previous performance by Random Collision and whether they visited the previous experiment (these data were aggregated so that participants scored 0 when they answered 'no' on both questions and 1 if either one of the answers was 'yes'), and whether and to what extent they knew any of the dancers in the performance. Participants were also asked whether they had come to the performance alone. Finally, we asked for age, gender and nationality.

## Results

The means and standard deviations are reported in Table 2. To analyse the data, the same contrasts were used as in Experiment 1. Intraclass Correlation Coefficients (ICC1's) ranged from 0.03 to 0.11 (median = 0.08). Unbiased estimates of between-audience ICC's ranged from 0.00 to 0.08 (median = 0.01). The data were again analysed multilevel. The models were analysed with random intercepts. Random slopes did not improve model fit. We controlled for individual differences in reported cultural behaviour, dance behaviour, whether the participant came alone to the experiment or not, whether they knew one of the dancers<sup>11</sup>.

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<sup>11</sup> As in Experiment 1, the effects of these control variables are not reported because we had no prior hypotheses about these and they were not of central interest.

**Perceived relations among dancers.** Figure 5 shows the effects of perceived relationships among the dancers. Replicating the results of Experiment 1, participants in the solidarity conditions perceived more entitativity among the dancers than participants in the individuals condition. This was a medium-sized effect,  $b = 0.57$ ,  $t(9) = 4.21$ ,  $p = .002$ , 95% CI [0.26, 0.87],  $d = 0.53$ . There was no difference between the mechanical and organic solidarity condition,  $b = 0.07$ ,  $t(9) = 0.51$ ,  $p = .62$ , 95% CI [-0.25, 0.40],  $d = 0.07$ .

To analyse the perceived personal value to the performance we used the same contrasts as in Experiment 1. There was a medium-sized effect showing that dancers in the organic condition were perceived as having more personal value than dancers in the mechanical and individuals conditions,  $b = 0.64$ ,  $t(9) = 3.98$ ,  $p = .003$ , 95% CI [0.28, 1.02],  $d = 0.54$ . The orthogonal contrast was not significant,  $b = 0.20$ ,  $t(9) = 1.08$ ,  $p = .31$ , 95% CI [-0.21, 0.62],  $d = 0.17$ .

**Solidarity with the dancers.** The results replicated those of Experiment 1 (see Figure 6). A medium-sized effect revealed that in the conditions in which solidarity was displayed on stage, participants also experienced more solidarity with the dancers than participants in the individuals condition,  $b = 0.74$ ,  $t(9) = 3.44$ ,  $p = .007$ , 95% CI [0.26, 1.22],  $d = 0.64$ . There was no difference between the two solidarity conditions,  $b = -0.09$ ,  $t(9) = 0.36$ ,  $p = .72$ , 95% CI [-0.62, 0.45],  $d = -0.07$ .

**Solidarity between audience and dancers.** With the new measure, we find the predicted effect. In the conditions where solidarity was displayed among the dancers on stage, more solidarity emerged between audience and dancers, compared with the individuals condition. This was a medium-sized effect,  $b = 0.68$ ,  $t(9) = 3.94$ ,  $p = .003$ , 95% CI [0.29, 1.07],  $d = 0.60$ . There was no difference between the mechanical and the organic solidarity condition,  $b = -0.34$ ,  $t(9) = 1.80$ ,  $p = .10$ , 95% CI [-0.77, 0.08],  $d = 0.29$ .

**Artistic evaluation.** As can be seen in Figure 7, we replicated the results of Experiment 1. There was a medium-sized effect: in the solidarity conditions the artistic evaluation was better,  $b = 0.84$ ,  $t(9) = 5.80$ ,  $p = .0003$ , 95% CI [0.52, 1.17],  $d = 0.78$ . The mechanical and organic solidarity condition did not differ,  $b = 0.14$ ,  $t(9) = 0.90$ ,  $p = .39$ , 95% CI [-0.21, 0.49],  $d = 0.13$ .

**Mediation models.** We performed the same mediation analysis as in Experiment 1. Solidarity in the mechanical condition, vs. the individuals condition, was mediated by perceived entitativity (indirect effect  $ab = 0.107$  [0.031, 0.217]), but not by perceived personal value ( $ab = -0.045$  [-0.144, 0.052]). The other relevant statistics can be found in the top half of Figure 7.

In the organic solidarity condition (vs. individuals), solidarity with the dancers was mediated by both perceived entitativity ( $ab = 0.121$  [0.035, 0.245]) and perceived personal value ( $ab = 0.122$  [0.035, 0.270], see bottom half of Figure 7).

For artistic evaluation, we also replicated the results of Experiment 1, see Figure 8. In the mechanical solidarity condition (vs. individuals), artistic evaluation was mediated by perceived entitativity ( $ab = 0.099$  [0.029, 0.205]), but not by perceived personal value ( $ab = -0.060$  [-0.167, 0.071], see top half Figure 8). In the organic solidarity condition (vs. individuals), artistic evaluation was mediated by both perceived entitativity ( $ab = 0.112$  [0.035, 0.221]) and perceived personal value ( $ab = 0.161$  [0.059, 0.328], see bottom half Figure 8).<sup>12</sup>

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<sup>12</sup> As can be seen in the supplementary materials, for the model in which perceived personal value mediates the effect of the organic contrast (D2) on artistic evaluation, there also was a significant between-audiences indirect effect ( $ab = 0.354$  [0.031, 0.885]) suggesting that in terms of this aspect of audience perceptions, there was at least some between-audience effect too. Although not expected, this points to the possibility that audience reactions may have amplified individual audience member experiences. However, we point out that this is an isolated finding: we do not want to overinterpret this result.

**Feelings evoked by the performance.** To explore the answers to open question about the feelings evoked by the performances, we categorized the words used by participants into six categories: positive valuations, negative valuations, descriptions of arousal, descriptions of structure, descriptions of chaos, and descriptions of a social nature<sup>13</sup>. Each word was coded for its match with the six categories (1 = match, 0 = no match). For example, ‘affection’ was categorized as positive as well as social. ‘Playful’ was categorized as positive, arousing and social. Ambiguous words such as ‘recognition’, ‘artificial’, or ‘delay’ were not categorized in any of the categories. Scores were calculated by summing all the matches by category: a participant who mentioned three arousal words scored three whereas someone mentioning none scored zero.

Because these count data were positive skewed, we conducted a multilevel Poisson regression using glmer from the lme4-package in R (Bates, Maechler, Bolker, & Walker, 2015). We used the same contrasts as above (Contrast 1 and 2), again controlling for cultural behaviour, dance behaviour and whether the participants came alone to the performance or not.

Table 3 displays the descriptives for the number of words used per condition. In line with previous findings on the audiences’ overall positive evaluation, the solidarity conditions evoked more positive feelings than the individuals condition,  $b = 0.58$ ,  $SE = 0.14$ ,  $z = 4.18$ ,  $p < .001$ , 95% CI [0.31, 0.85], odds ratio OR = 1.78. There was no difference between the mechanical and organic condition,  $b = -0.12$ ,  $SE = 0.12$ ,  $z = -1.04$ ,  $p = .296$ , 95% CI [-0.36, 0.11], OR = 0.88. Parallel to this, the individuals condition evoked more negative feelings than the solidarity conditions did,  $b = -0.50$ ,  $SE = 0.10$ ,  $z = -5.05$ ,  $p < .001$ , 95% CI [-0.70, -

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<sup>13</sup> We coded the words independently of condition; all words were extracted from the data and put into alphabetical order to be coded. After coding each participant was assigned a value for each category based on the number of words this participant used from that category. We also coded explicit references to expressions of non-arousal as well as antisocial or asocial references, but on these variables, there were few hits and no significant effects so we do not report them here.



0.31], OR = 0.60. There was also an unexpected effect for the mechanical condition to evoke more negative feelings than the organic condition,  $b = -0.26$ ,  $SE = 0.13$ ,  $z = -2.07$ ,  $p = .038$ , 95% CI [-0.51, -0.01], OR = 0.77.

With respect to arousal words, there was no difference between the solidarity conditions and the individuals condition,  $b = -0.08$ ,  $SE = 0.08$ ,  $z = -0.90$ ,  $p = .369$ , 95% CI [-0.24, 0.09], OR = 0.93. Interestingly, participants described the mechanical solidarity condition as more arousing than the organic solidarity condition,  $b = -0.20$ ,  $SE = 0.09$ ,  $z = -2.21$ ,  $p = .032$ , 95% CI [-0.38, -0.02], OR = 0.82.

With respect to words referring to structure, the results have to be interpreted with some caution because only 28 out of the 371 participants (= 7.55%) used structure words to describe their own feelings. The solidarity conditions evoked more feelings of structure and orderliness than the individuals condition did,  $b = 2.40$ ,  $SE = 1.02$ ,  $z = 2.36$ ,  $p = .018$ , 95% CI [0.85, 5.29], OR = 11.06. The large effect size is due to the fact that in the individuals condition almost no structure words were used. Moreover, participants in the mechanical condition used more structure words than participants in the organic condition, although this effect did not reach statistical significance,  $b = -0.65$ ,  $SE = 0.40$ ,  $z = -1.64$ ,  $p = .101$ , 95% CI [-1.49, 0.10], OR = 0.52.

Parallel to this, participants in the individuals condition used more chaos words to describe their feelings than participants in the solidarity conditions,  $b = -0.67$ ,  $SE = 0.34$ ,  $z = -2.00$ ,  $p = .046$ , 95% CI [-1.48, 0.08], OR = 0.50. There was no difference in chaos words between the mechanical condition and the organic condition,  $b = -0.41$ ,  $SE = 0.43$ ,  $z = -0.96$ ,  $p = .340$ , 95% CI [-1.35, 0.57], OR = 0.66.

In line with the hypothesis, participants in the solidarity conditions reported more social feelings than in the individuals condition,  $b = 1.05$ ,  $SE = 0.25$ ,  $z = 4.29$ ,  $p < .001$ , 95% CI [0.60, 1.56], OR = 2.86. Also, there was a tendency for participants in the organic

condition to use more social words than in the mechanical condition,  $b = 0.33$ ,  $SE = 0.17$ ,  $z = 1.93$ ,  $p = .054$ , 95% CI [-0.01, 0.67], OR = 1.40<sup>14</sup>.

## Discussion

Experiment 2a replicated the findings of Experiment 1. Even though the distance between audience and dancers was greater because of the more classical “theatre style” setup, the effects were stronger overall. This is most likely due to the fact that the choreographies included a broader range of displays of how various forms of solidarity can be embodied, because performances were longer, and because intra-condition variability was reduced. The net result was that, as in Experiment 1, the relations displayed on stage are perceived and experienced as predicted. Participants perceived more entitativity among the dancers when they observed mechanical or organic solidarity compared to individuals (Hypothesis 1a). As expected, in the organic condition, the audience believed that individual dancers had more personal value to the performance than in the mechanical and individuals conditions (Hypothesis 1b).

Furthermore, after watching the mechanical performance the audience described their feelings with somewhat more structure and coherence words and somewhat less social words than after the organic performance. Also, the presence of clear social structure and unity among the dancers in the mechanical condition seems to result in more feelings of arousal among audience members than the organic condition. This suggests that mechanical solidarity was experienced qualitatively differently than organic solidarity.

The results of Experiment 1 were replicated and extended when it comes to the solidarity that the audience experienced with the dancers. As predicted, in the solidarity condition the audience felt more solidarity with the dancers, felt more solidarity between

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<sup>14</sup> When participants who knew the dancers were excluded, the difference between the mechanical and organic condition became non-significant,  $b = 0.20$ ,  $SE = 0.18$ ,  $z = 1.13$ ,  $p = .260$ , 95% CI [-0.15, 0.55].

dancers and the audience *as a whole*, and used more social and structure words and less chaos words to describe their feelings after the performance (Hypothesis 2a).

We also replicate and extend the effects of Experiment 1 on artistic evaluation. Participants in the solidarity conditions had a better artistic evaluation than participants in the individuals condition. In addition, the solidarity performances were evaluated more positively, and less negatively (in the open questions), than the performances with an aggregate of individuals (Hypothesis 4a).

Finally, there was evidence that the process through which people experience solidarity with the dancers was qualitatively different in the mechanical and organic conditions. Mechanical performances evoke solidarity and a positive artistic evaluation through perceptions of entitativity of the dancers. But the organic performances evoke these feelings also because individual dancers are perceived to have personal value to the performance (Hypotheses 2b and 4b). This individuation of the dancers is a distinctive feature of organic performances and it plays a role in the enjoyment of the performance and the experience of unity. Thus, mechanical and organic solidarity evoke solidarity via different pathways. Moreover, the social interpretation of the performance played a key role in the artistic impact of the piece.

### **Experiment 2b**

In the second part of Experiment 2 we examined the consequences of observing the performances for subsequent social behaviour among the audience. Social behaviour was measured by filming the interaction between audience members during a cooperative task. Previous research shows that synchronous movements foster cooperative behaviour (Reddish et al., 2013; Valdesolo et al., 2010; Wiltermuth & Heath, 2009). If we apply this to the observer, this suggests that mechanical solidarity is most likely to evoke cooperative behaviour in an audience. However, we believe that cooperative behaviour can also emerge

more organically. Therefore, we hypothesize that observing organic solidarity also fosters cooperative behaviour, but that the way in which this cooperating emerges may be different; i.e., a more bottom-up process. In other words, we predicted that audiences who had seen mechanical solidarity would choose to organise themselves in an explicit manner (i.e., first organise, then act), whereas audiences who had seen organic solidarity would organize themselves through a more interactive process (act and organise when this becomes necessary). We believed that audiences who had seen an aggregate of individuals perform, would lack the sense of social structure necessary to cooperate successfully with one another.

## Method

**Procedure and materials.** After filling in the questionnaire in the theatre (Experiment 2a), the audience was asked to go into a different room for a group task. In this room a still life, a collection of objects placed in a certain way, was created. When the audience had entered the room, they received the task instructions via a voice-over (in Dutch and English). The goal of the task was to move the still life from one side of the room to the other side of the room. The participants had five minutes to complete this task; the start and end was signalled by the sound of a bell. The only rule in this task was that as soon as one had touched an object this person was not allowed to move his/her feet anymore. The task thus required that participants coordinated their efforts in order to complete the task. The proceedings were filmed from two cameras on the ceiling.

## Results

Thirteen coders – blind to condition – were asked to rate the level of structure in the group on a scale from 1 (= completely unstructured) to 7 (= completely structured) of screenshots (in random order) from the video data<sup>15</sup>. The interrater reliability was high,  $ICC(2,13) = .91$  (LeBreton & Senter, 2008; McGraw & Wong, 1996). Screenshots were

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<sup>15</sup> For an impression of this video data, see <https://vimeo.com/149382701> (password: Reconstruction).

provided from every group every 10 seconds until 3 minutes into the task (we suspected the remaining 2 minutes to be less interesting because the rules of the task forced participants to move less and less over the course of the task). Figure 9 shows the pattern of structure over time for each condition<sup>16</sup>. Repeated measures analyses were performed using nlme package in R (Pinheiro et al., 2016). To analyse the data the same two contrasts were used as in Experiment 1 and 2. Contrasts, time, and their interaction were included in the model. The analysis revealed that the main effects for the contrasts and the interaction between Contrast 2 and time were not significant, all  $t$ 's  $< 1.57$ . The main effect for time was significant: groups became more structured over time,  $b = 0.05$ ,  $t(176) = 4.65$ ,  $p < .001$ , 95% CI [0.03, 0.08]. Effects were qualified by a significant Contrast 1 by time interaction: in the mechanical and organic conditions, structure increased more strongly over time than in the individuals condition,  $b = 0.06$ ,  $t(176) = 2.46$ ,  $p = .015$ , 95% CI [0.01, 0.11]. The model fit with the contrasts and interaction terms was significantly better than the model with time only,  $\Delta AIC = -1.52$ ,  $\logLikelihood\ ratio\ \chi^2(4) = 9.52$ ,  $p = .049$ .

Figure 9 suggests that the pattern of structure between the three conditions differs per phase. For the first phase – the first 50 seconds – there seems to be an increase in structure for the mechanical condition, but not so much for the organic and individuals conditions. The second phase – 60 to 110 seconds – seems to lack a clear pattern. However, the last phase – 120 to 180 seconds – suggests relatively little increase in structure, but a higher stable level of structure in both the mechanical and organic conditions compared to the individuals condition. To test whether these patterns per phase were statistically significant we performed

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<sup>16</sup> Due to technical problems, the voice-over instructions did not work for one of the groups. Even though this group eventually did the task too, we decided to exclude these data from the analysis. Furthermore, data collection from the coders went via an online questionnaire, unfortunately some time points were not rated and are therefore missing. This missing data included the first 60 seconds of one of the groups in the organic condition and two other time points in the organic and mechanical condition.

post hoc exploratory analyses<sup>17</sup>. Therefore, the three time phases were analysed separately. Based on the visual inspections we expected to find a difference between the mechanical condition and the other two conditions but no difference between the organic and the individuals condition for the first phase. Therefore, we used two tailored contrasts; one compared the mechanical condition with the other two (individuals = -1/3, mechanical = 2/3, organic = -1/3) and the orthogonal contrast compared the organic condition with the individuals condition (individuals = -1/2, mechanical = 0, organic = 1/2). Here, we analysed the model without the time by contrast interaction terms because the model with the interactions terms did not add significantly to the model fit compared to the model with the main effects only,  $\Delta AIC = 1.71$ ,  $\logLikelihood\ ratio\ \chi^2(2) = 2.29$ ,  $p = .318$ . In line with our reasoning, we found that the mechanical condition was more structured in the first phase than the individuals and organic conditions,  $b = 1.05$ ,  $t(7) = 3.36$ ,  $p = .012$ , 95% CI [0.34, 1.75]. The orthogonal contrast was not significant,  $b = -0.07$ ,  $t(7) = -0.18$ ,  $p = .860$ , 95% CI [-0.96, 0.82]. Moreover, groups became significantly more structured over time,  $b = 0.25$ ,  $t(39) = 3.11$ ,  $p = .004$ , 95% CI [0.10, 0.41].

For the second phase, we found no significant main or interaction effects, all  $|t|$ 's < 1.68. Here, there was considerably more variability in each of the conditions—something which may have been an artefact of the coding instructions (see discussion). In phase 3, however, clear between-condition differences appeared to exist. Because on the basis of visual inspection we expected both the mechanical and the organic condition to be more structured compared to the individuals condition, we used the same contrasts as above (Contrast 1 and Contrast 2). The interaction terms did not improve the model fit significantly,  $\Delta AIC = 3.79$ ,  $\logLikelihood\ ratio\ \chi^2(2) = 0.21$ ,  $p = .901$ , and were therefore excluded from

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<sup>17</sup> In order to verify the observed patterns in these phases we performed statistical test on the data. However, please note that the outcomes of these analyses should be interpreted with caution because the phases were based on post hoc inspection of the data.

the model. In line with our reasoning, we found that the mechanical and organic conditions were more structured in phase 3 than the individuals condition, although this effect was only marginally significant,  $b = 1.16$ ,  $t(8) = 1.96$ ,  $p = .085$ , 95% CI [-0.17, 2.49]. There was no difference between the mechanical and the organic condition,  $b = 0.002$ ,  $t(8) = 0.002$ ,  $p = .998$ , 95% CI [-1.39, 1.39]. Furthermore, the overall structure increased over time in phase 3,  $b = 0.09$ ,  $t(75) = 3.26$ ,  $p = .002$ , 95% CI [0.03, 0.14].

## Discussion

The exploratory analyses of the behaviour during the post-performance task revealed an interesting pattern; audience members in the mechanical condition appeared to be able to organize themselves very quickly. In contrast, audience members in the organic condition were able to organize themselves to the same extent, but this took longer to establish. In the individuals condition audiences were overall less structured than the other conditions, as they may have internalized the individualized experience of the performance.

Surprisingly, we found no effects in the second phase. Structure appeared to differ substantially over time with increases and decreases in amount of structure in only a 50 second time frame. This phase 2 variability may have been a result of the coding method; coders merely rated screenshots in random order of all the videos. Phase 2 was the time frame in which participants moved objects through space. As a result, the space often appeared cluttered from above; several objects in space and participants stretching to reach out to or pass on objects. We believe some of the richness of information obtained when tracking a group's behaviour frame-by-frame is lost when merely judging randomly ordered single frames.

## Experiment 3

The main aim of the third experiment was to replicate the findings from Experiment 2 in a more controlled lab setting. Videos from one of the performances of Experiment 2 were

shown to audiences in a theatre setting. Participants were asked the same questions as in Experiment 1 and 2, but this time the setting was a research environment and all participants entered knowing they would participate in a piece of research. A secondary aim was to investigate more thoroughly what could account for differences between performances. Specifically, a reviewer suggested that the individuals condition may have conveyed to viewers that the dancers experienced discomfort, which may have led the audience to experience discomfort too. In this replication, we therefore assessed perceptions of discomfort among the dancers and experiences of personal discomfort in order to establish whether either could explain audiences' subsequent social perceptions and feelings.

## Method

**Design and power analysis.** The design of the study was a one-way design with three conditions (individuals, mechanical and organic solidarity performance). We displayed videos of performances in a high-quality theatre with 14 seats. Audience members are therefore nested in viewing sessions, requiring a multilevel analysis. There are no off-the-shelf solutions for power calculations with multilevel models. We therefore decided to simulate the data based on the results of experiment 2 (using the `simulate.Mermod` function in the `lme4` package, version 1.1-13, with 5000 simulations). Simulations suggest that power to replicate the effects on belongingness would be .87 with  $N = 126$  (an average of 6 participants in 21 viewing sessions) and .91 with  $N = 147$  (an average of 7 participants per session). We aimed to recruit 126 participants or more.

**Participants.** One hundred and forty-five participants were recruited ( $M_{age} = 21.58$ ,  $SD_{age} = 2.88$ , 79 female, 65 male, 1 did not indicate a gender) and participated for course credit or a monetary reward of €8. The experiment was conducted in English and the sample was mostly Dutch (31 participants and 1 Greek/Dutch) and German (65 participants and 4 German and other nationality). All but one participant indicated that they were students



(mostly psychology, 111 participants) and all indicated having good English language proficiency.

Participants viewed the videos in 21 small groups of, on average, 7 participants. Groups were randomly assigned conditions: organic solidarity ( $n = 46$ ), mechanical solidarity ( $n = 52$ ), or individuals ( $n = 47$ ). Each condition consisted of seven groups. Using the same method as above, no outliers were detected.

**Procedure and materials.** Participants were invited to a theatre with a large screen and 14 seats. Participants watched one of the three videos of the dance performances from Experiment 2a. After the viewing, the participants were asked to complete an online questionnaire similar to Experiment 1 and 2. Because questions were administered online, there was no missingness. Items were answered on a seven-point scale. At the end, several demographic questions were answered. We present only the variables of main interest in this paper. For the full questionnaire and descriptive statistic of the other variables, see the supplementary materials.

***Experienced and perceived discomfort.*** In the first section of the questionnaire participants were asked to indicate to what extent they felt (dis)comfort during the performance and to what extent the dancers appeared to experience (dis)comfort. We used semantic differentials with anchors on each side of a 7-point scale; ‘I felt unpleasant, not at ease, uncomfortable’ versus ‘I felt pleasant, at ease, comfortable’ and ‘The dancers were unpleasant, not at ease, uncomfortable’ versus ‘The dancers were pleasant, at ease, comfortable’ (adapted from Osgood, Suci, & Tannenbaum, 1967).

***Perceived relations among dancers.*** *Perceived entitativity* among the dancers and *perceived personal value* of each dancer were measured as in the previous experiments ( $\alpha = .84$  and  $\alpha = .77$  respectively). Furthermore, four items measured whether the dancers were perceived as *directed*, to assess whether, with choreographed performances, we would find

the same pattern as with the improvised performances from Experiment 1 (now including a fourth item 'I think the performance was improvised',  $\alpha = .77$ ).

***Solidarity with the dancers.*** A single item was included to measure *identification with the dancers* (Postmes, Haslam, & Jans, 2013). Similar to Experiment 1, three items measured to what extent the participants felt a sense of *belonging* to the dance group (Van Beest & Williams, 2006). As in previous studies, the four items were correlated highly and were aggregated ( $\alpha = .88$ ).

***Solidarity with the audience.*** A single item for identification, two items for belonging, and one item for entitativity, were included to measure the extent to which participants felt *solidarity with the audience group*. These four items were aggregated ( $\alpha = .89$ ).

***Artistic evaluation.*** To measure *evaluation of the dance performance*, three items were included; 'I thought the performance was well executed', 'I enjoyed the performance', and 'I thought the movements of the dancers looked professional' (Cronbach's  $\alpha = .76$ ). Another three items measured *evoked interest*; 'Because of this performance my interest in modern dance increased', 'I would like to see this performance live', and 'I would like to see other work from these dancers' ( $\alpha = .88$ ). The scales and items were closely related ( $r = .74$ ;  $\alpha = .89$ ) and collapsed.

***Control variables.*** Lastly, demographic information was asked. Cultural behaviour was measured as in previous experiments ( $\alpha = .73$ ). Two items measured to what extent audience members knew any of the dancers or the fellow participants on a scale from 0 (not at all) to 4 (very good) (answering for the person they knew best). Because only three participants indicated knowing (one of) the dancers barely to somewhat, this variable was disregarded in the analyses. Some control questions asked participants whether they already knew or had heard about the performance that was performed a couple of years earlier in Groningen. Two participants indicated that they had heard about the performance, but no

participants had seen the performance. Finally, we asked the participants their age, gender, nationality, study, English proficiency (speaking, reading, and listening on a 7-point scale,  $\alpha = .83$ ) and what they thought the purpose of the study was.

## Results

The aim was to replicate the findings and to assess whether the effects found in the individuals condition could be explained by the unpleasant experience of viewing this performance. We used the same contrasts as above. The Intraclass Correlation Coefficients ranged from 0.00 to 0.15 (median = 0.11). Unbiased estimates of between-audience ICC's ranged from 0.00 to 0.05 (median=0.002). Again, data was analysed multilevel<sup>18</sup> with random intercept: including random slopes did not significantly improve model fit. As in previous experiments, we controlled for cultural behaviour<sup>19</sup>.

**Perceived relations among the dancers.** Figure 10 shows the effects of perceived relationships among the dancers. As hypothesized, a medium-sized effect showed that participants in the solidarity conditions perceived more entitativity among the dancers in the video than participants in the individuals condition,  $b = 0.85$ ,  $t(18) = 3.63$ ,  $p = .002$ , 95% CI [0.37, 1.34],  $d = 0.74$ . There was no difference between the mechanical and organic solidarity condition,  $b = 0.18$ ,  $t(18) = 0.67$ ,  $p = .514$ , 95% CI [-0.38, 0.73],  $d = 0.16$ .

To analyse perceived personal value, the same tailored contrasts were used as in Study 1 and 2a. A large effect showed that, as in previous experiment, personal value among the dancers was higher in the organic condition than in the other two conditions,  $b = 1.16$ ,  $t(18) =$

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<sup>18</sup> Unilevel analysis yielded almost identical results.

<sup>19</sup> In this experiment participants signed up independently of one another. Some participants knew each other beforehand, but only 10.3% (6.4% in the individuals condition, 15.3% in the mechanical condition, and 8.7% in the organic condition) knew another participant well or very well (the remaining 24.2% knew someone barely or somewhat). Controlling for previous acquaintance between participants did not alter the results, therefore we did not control for this in the analysis described in this paper.

5.10,  $p < .001$ , 95% CI [0.69, 1.64],  $d = 1.04$ . We found no difference on the orthogonal contrast,  $b = 0.12$ ,  $t(18) = 0.47$ ,  $p = .645$ , 95% CI [-0.41, 0.65],  $d = 0.11$ .

Finally, directedness was analysed using the same tailored contrast as in Study 1. We found no evidence for a difference between participants in the mechanical and the other two conditions,  $b = 0.09$ ,  $t(18) = 0.41$ ,  $p = .685$ , 95% CI [-0.36, 0.53],  $d = 0.08$ . Nor was there a significant difference on the orthogonal contrast,  $b = 0.43$ ,  $t(18) = 1.66$ ,  $p = .114$ , 95% CI [-0.10, 0.96],  $d = 0.39$ . This finding is likely caused by the fact that the performances from Experiment 2 were all choreographed and thus looked equally directed (as opposed to the improvised performances from Experiment 1).

**Solidarity with the dancers.** In line with the hypothesis, we found a large effect showing that participants in the solidarity conditions experience more solidarity with the dancers than the participants in the individuals condition,  $b = 0.95$ ,  $t(18) = 3.50$ ,  $p = .003$ , 95% CI [0.39, 1.52],  $d = 0.81$ . As expected, we found no difference between the participants in the mechanical and participants in the organic condition,  $b = 0.11$ ,  $t(18) = 1.49$ ,  $p = .155$ , 95% CI [-0.18, 1.10],  $d = 0.39$  (see Figure 11).

**Solidarity among the audience.** Like the previous experiments, we found no effects on solidarity among the audience, all  $|t|$ 's  $< .39$ , *ns* (see Figure 11).

**Artistic evaluation.** A large effect was found, as in the previous experiments, showing that in the solidarity conditions the performance was evaluated more positively than in the individuals condition,  $b = 0.93$ ,  $t(18) = 4.18$ ,  $p < .001$ , 95% CI [0.47, 1.40],  $d = 0.84$ . Surprisingly, participants in the organic condition found the performance better than participants in the mechanical condition,  $b = 1.04$ ,  $t(18) = 4.09$ ,  $p < .001$ , 95% CI [0.51, 1.57],  $d = 0.94$  (see Figure 11).

**Experiences and perceived discomfort.** The effects of experienced and perceived discomfort are shown in Figure 12. As expected, a large-sized effect showed that participants

in the individuals condition felt less pleasant, at ease, and comfortable than the participants in the solidarity conditions,  $b = 1.12$ ,  $t(18) = 3.71$ ,  $p = .002$ , 95% CI [0.50, 1.75],  $d = 0.87$ . Also, a marginally significant effect showed that participants in the organic condition felt slightly more pleasant, at ease, and comfortable than participants in the mechanical condition,  $b = 0.61$ ,  $t(18) = 1.77$ ,  $p = .093$ , 95% CI [-0.10, 1.33],  $d = 0.48$ . When we look at appraisal, we see that participants in the individuals condition find the dancers less pleasant, at ease, and comfortable than participants in the solidarity conditions,  $b = 1.31$ ,  $t(18) = 4.18$ ,  $p < .001$ , 95% CI [0.66, 1.96],  $d = 0.99$ . We found no difference in appraisal of pleasantness between participant in the mechanical and participants in the organic condition,  $b = 0.46$ ,  $t(18) = 1.29$ ,  $p = .213$ , 95% CI [-0.28, 1.20],  $d = 0.35$ .

More interestingly, however, was whether these perceptions and feelings of unpleasantness affected the perceptions and feelings of solidarity, and could thus explain our effects. To test this, we added the pleasantness variables to the models of perceived entitativity and solidarity with the dancers. Controlling for *feelings* of pleasantness, ease, and comfort, the effect for perceived entitativity remains; participants in the solidarity conditions perceived more entitativity among the dancers than participants in the individuals condition,  $b = 0.75$ ,  $t(18) = 3.05$ ,  $p = .007$ , 95% CI [0.24, 1.25],  $d = 0.66$ . Again, there was no difference between participants in the mechanical and participants in the organic condition,  $b = 0.12$ ,  $t(18) = 0.45$ ,  $p = .661$ , 95% CI [-0.44, 0.68],  $d = 0.11$ . Furthermore, participants in the solidarity condition perceived more entitativity than participants in the individuals condition, irrespective of the *appraisal* of pleasantness, ease, and comfort among the dancers,  $b = 0.56$ ,  $t(18) = 2.37$ ,  $p = .029$ , 95% CI [0.07, 1.06],  $d = 0.51$ . No difference was found between participants in the mechanical and participants in the organic condition,  $b = 0.08$ ,  $t(18) = 0.30$ ,  $p = .769$ , 95% CI [-0.46, 0.61],  $d = 0.07$ .

Moreover, we see that, irrespective of *feelings* of pleasantness, ease, and comfort, participants in the solidarity condition felt more solidarity with the dancers than participants in the individuals condition,  $b = 0.58$ ,  $t(18) = 2.24$ ,  $p = .038$ , 95% CI [0.04, 1.12],  $d = 0.52$ . There was no difference between participants in the mechanical and participants in the organic condition,  $b = 0.27$ ,  $t(18) = 0.92$ ,  $p = .371$ , 95% CI [-0.33, 0.86],  $d = 0.24$ . We found the same pattern when controlling for *appraisal* of pleasantness, ease, and comfort of the dancers, Contrast 1,  $b = 0.72$ ,  $t(18) = 2.55$ ,  $p = .020$ , 95% CI [0.14, 1.31],  $d = 0.63$ , Contrast 2,  $b = 0.38$ ,  $t(18) = 1.24$ ,  $p = .230$ , 95% CI [-0.25, 1.02],  $d = 0.33$ <sup>20</sup>.

**Mediation models.** As in the previous experiments we performed a mediation analysis. The results from previous experiments were partially replicated. See Figures 13 and 16 for all path statistics. In the mechanical condition, vs. the individuals condition, solidarity with the dancers was neither mediated by perceived entitativity (Indirect effect  $ab = 0.101$  [-0.046, 0.328], one-sided  $p = .13$ ), nor by perceived personal value ( $ab = -0.020$  [-0.165, 0.101], one-sided  $p = .40$ ), see top half of Figure 13. However, in the organic condition, compared to the individuals condition, solidarity with the dancers was, like in Experiment 1 and 2, mediated by perceived personal value ( $ab = 0.124$  [-0.060, 0.390], one-sided  $p = .01$ ), but not by perceived entitativity ( $ab = 0.124$  [-0.060, 0.390], one-sided  $p = .12$ ), see bottom half of Figure 14.

For artistic evaluation, we found the same pattern; the mechanical condition, compared to the individuals condition, was neither mediated by perceived entitativity ( $ab = 0.085$  [-0.040, 0.290], one-sided  $p = .13$ ), not by perceived personal value ( $ab = -0.036$  [-0.24, 0.186], one-sided  $p = .43$ ), see top half of Figure 14. In the organic (vs. individuals) condition, artistic evaluation of the performance was mediated by perceived personal value ( $ab = 0.406$

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<sup>20</sup> Post hoc analysis of these data for Experiment 1 showed roughly the same, see footnote 5 and 6 and Table 4 and 5 of the supplementary material.

[0.150, 0.693], one-sided  $p = .002$ ), but not perceived entitativity ( $ab = 0.105$  [-0.049, 0.348], one-sided  $p = .12$ ) see bottom half of Figure 14.

## Discussion

We found that the effects for perceived entitativity, perceived personal value, and solidarity with the dancers replicated in the lab. Notably, even though audiences watched a video recording of performance, effects are just as large as with the live performances. This may be, in part, due to the experimental control we had in this study, but may also be a testament to the strength of these effects; it certainly shows that a group does not need to be physically present in order for observers to be socially affected.

In addition, we found that the individuals condition causes more feelings of unpleasantness, unease, and discomfort, and the dancers in this condition are appraised as more unpleasant, uneasy, and uncomfortable. However, neither of these explain the effects of perceptions of entitativity and solidarity with the dancers. This is important because it shows that the effects on perceptions and feelings of solidarity are not confounded by perceptions and feelings of discomfort.

Lastly, the mediation analyses are partially replicated. As in Experiment 1 and 2, perceived personal value only mediated solidarity and artistic evaluation in the organic (vs. individuals) condition, and not in the mechanical (vs. individuals) condition. In this experiment perceived entitativity mediated neither solidarity nor artistic evaluation. This is due to the non-significant relationship between perceived entitativity and solidarity with the dancers. That is, perceiving unity among the dancers did not lead to experiencing solidarity with them (although effects were in the expected direction). This may be a consequence of watching the performance on screen rather than live. When the dancers are physically present, audiences may more easily feel part of the entity that they observe, thus leading to stronger

experiences of solidarity. When dancers are not physically present, connecting to the dancers in such a way may be more difficult.

### **General Discussion**

What do these results tell us about the impact of art? First and foremost, we have shown that social psychological processes of group dynamics underpin the impact of performing art on audiences. The group dynamics displayed on stage by a group of dancers shape both the relationship that emerges between audience and dancers *and* it shapes the overall enjoyment of the artistic performance. The pathways that connect audiences to live performances are not just aesthetic; they are grounded in elementary social psychological processes. This finding suggests that modern dance may have the power to shape and alter its audience, which implies that it can influence communities.

The results of three experiments support this overarching conclusion. We proposed that the form of solidarity displayed on stage (mechanical or organic) would (a) be recognizable to the audience, (b) shape the type of solidarity that the audience develops with the dancers, and (c) transform the subsequent relationships among the audience members. All these hypotheses were confirmed.

Most straightforwardly, the forms of solidarity displayed in different dance performances were recognized and understood by the observers. Performances that expressed solidarity were perceived as more entitative than performances that did not (Hypothesis 1a). In expressions of organic solidarity, audiences recognized the individuality and indispensable contribution of each dancer (Hypothesis 1b).

Important to note is that the bond that the audience developed with the performance was influenced by the kind of solidarity on display. Audiences who saw mechanical and organic solidarity felt more solidarity with the dancers (in Experiment 1, 2, and 3; Hypothesis 2a). Importantly, this was achieved very differently when organic solidarity was displayed



than when mechanical solidarity was displayed. When the dancers displayed mechanical solidarity (compared to acting as an aggregate of individuals) the audience bonded more strongly because the dancers were perceived as united (in Experiment 1 and 2, but not in Experiment 3). But when the dancers displayed organic solidarity, the perception of individual value of each dancer played a key role in the development of a bond between the audience and dancers (in Experiment 1, 2, and 3; Hypothesis 2b).

Finally, the artistic evaluation of the performance also dependent on the solidarity displayed on stage: solidarity fostered interest in the dance group and positive evaluations of the performance (Hypothesis 4a). Again, the pathways involved were different for each solidarity condition: only in the organic condition did the individual value of dancers matter to the evaluation (Hypothesis 4b). Together, this shows that different pathways to solidarity determine how ‘passive’ observers connect to a group of actors on stage. This replicates findings of prior research in small groups (Koudenburg et al., 2015; Van Mourik Broekman et al., 2018), extending the process to audience-actor relations.

Qualitative data collected in the second experiment corroborate these findings. After watching a performance that expressed solidarity, audiences felt more positive, less chaotic and more social. Furthermore, mechanical solidarity evoked more feelings of arousal and structure and, unexpectedly, somewhat more negative feelings than organic solidarity. Finally, participants who watched organic solidarity felt slightly more social than participants who watched mechanical solidarity. Nevertheless, this effect is small and only appears on a single measure, therefore we do not want to attach too much value to it.

We hypothesized that the performance could also change the relations between audience members afterwards (Hypothesis 3). Experiment 1 and 3 found no evidence in questionnaires. But when the audience had an opportunity to interact in a post-performance game, in Experiment 2, the performance clearly influenced the amount of cooperation and

coordination among audience members. Importantly, the game had nothing to do with the performance: any carry-over effects must have been due to internalization of the social relations that were witnessed on stage. To get a good sense of these effects, we encourage readers to watch the video materials that accompany this paper<sup>21</sup>.

In the game, audiences in the solidarity conditions eventually reached high levels of co-ordinated collaboration, but in very distinct ways: Audiences who watched mechanical solidarity organized themselves quickly, those who watched organic solidarity more gradually (more organically, in a way). By contrast, audiences who had watched an aggregate of individuals were least able to organize themselves during the game. Feelings of incoherence and social confusion raised during the performance seem to have carried over in their own interactions. These results go beyond findings that synchrony leads to cooperation (Reddish et al., 2013; Valdesolo et al., 2010; Wiltermuth & Heath, 2009). Seeing complex forms of coordinated interaction can (implicitly) inform cooperation on a subsequent and unrelated task. Because the task was very dissimilar to the dance performance, this is a form of social learning.

Finally, Experiment 3 provided more insight into the interpretation of effects in the individuals condition. Experiment 1 and 2 showed that the individuals condition was perceived as more chaotic and less pleasant. We believe that this is inherent to a situation that lacks solidarity and social structure (and indeed the sensation of unpleasantness may well be a *consequence* of the lack of social structure in the individuals condition). On the advice of a reviewer, we checked whether these feelings of discomfort and unpleasantness were drivers of all other effects. Results showed that the effects on solidarity remained when controlling

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<sup>21</sup> For an impression of the performances, see <https://vimeo.com/147571434> (password: ExperimentA) for Experiment 1 and <https://vimeo.com/147849401> (password: ExperimentB) for Experiment 2.

for unpleasantness. Thus, the between-condition differences are not driven by these evaluations.

### **Implications**

The results have implications, first and foremost, for our understanding of what makes artistic expressions have an impact on audiences. Although it is very common to suggest that artistic impressions have a (positive) impact on the social cohesion of a community, it is rare to hear that art appeals because it is, itself, an expression of a sense of community. And yet that is precisely what we have shown here. Of course we should immediately hedge this claim with caveats: it is premature to generalize beyond the medium of dance, and we are in no position to compare the strength of the social (group dynamic) impact to alternative sources of impact. Nevertheless, we have shown strong and consistent evidence that the artistic appeal of a performance depends (at least in part) on the degree to which that performance expresses a sense of community (see also Van Mourik Broekman et al., 2018).

For social psychological theorising, the results are interesting because they challenge the idea that bystanders would remain passive outsiders when they are mere spectators to an event. The results suggest that one does not have to play an active role in an interactive group in order to experience the same quality of solidarity that the actors are expressing. Thus far most research has focused on the effects of interactions - mimicry, coordination, synchrony – on the development of rapport and solidarity (Bernieri & Rosenthal, 1991; Burgoon, Stern, & Dillman, 1995; Koudenburg et al., 2015; Lakin & Chartrand, 2003; Lakin, Jefferis, Cheng, & Chartrand, 2003; Stel, Van Baaren, & Vonk, 2008; Vacharkulksemsuk & Fredrickson, 2012; Valdesolo & DeSteno, 2011). The current research shows that group dynamical mechanisms may also explain how someone who is not taking physical part in an interaction may nevertheless feel psychologically involved in the same way. This finding that group formation evolved among the audience (who are mere bystanders, in some respects) implies that new

groups and possibly very large groups can emerge from the mere observation of a small group's interactions and that this audience adopts and internalizes, at least for some time, the qualities of the group that is perceived.

### **Limitations and Future Research**

In this research, we focused on dance. The question remains whether these effects also apply to other forms of (coordinated) interactions. Given that dancers are especially good in using body language to interact and convey meaning, the impact of seeing everyday interactions may be less strong. However, previous findings suggest that people are able to socially interpret 'normal' interactions of others as well (Bernieri, Davis, Rosenthal, & Knee, 1994; Lakens & Stel, 2011): it is possible that observing other forms of coordinated interaction has a similar impact. Therefore, we believe the transference of solidarity may be present in many interactions, both verbal and non-verbal.

With respect to the solidarity among the audience, we found no evidence in Experiment 1 and 3. The behavioural results of Experiment 2b, when audience members could interact with one another, did support the hypothesis. But some caution needs to be applied when interpreting these behavioural effects: results are based on the observation of eleven groups only. Replication of these findings with more groups is necessary to determine the stability of these effects.

Furthermore, the effects on experienced solidarity and artistic evaluation may have been a result of differences in quality of the performances. The performance with the aggregate of individuals may not have been as good (technically or artistically) as the other two performances. As a result, audiences were perhaps unable to connect with the performance and thus reported less solidarity and less positive (more negative) evaluations. However, we have reason to believe that this is not the case. In both experiments, the same dancers were on stage. Moreover, the performance with the aggregation of individuals from

Experiment 2 actually won the 2<sup>nd</sup> prize in an international choreography competition: even though the audience had difficulty relating to this performance, according to professionals it was of high artistic quality. Finally, responses in Experiment 3 showed that audiences considered the individuals performance to be equally good, well executed and professional as the mechanical performance (although the organic performance was rated even higher)<sup>22</sup>. As such, we believe the effects on solidarity and evaluation cannot be explained by differences in quality of the performances.

Finally, we note that experiments 1 and 2 were conducted during live performances. Historically, such live performances were a staple ingredient of social psychological research (e.g., the classic experiments of Asch, Sherif, and Milgram all depend on it, Smith & Haslam, 2012). Such setups make it more difficult to carefully control the *ceteris paribus* requirement. We devoted a lot of attention to this potential problem in both field experiments, and Experiment 3 was designed to specifically tackle this problem. On the basis of the consistent effects on how performances were perceived (e.g., perceived solidarity, perceived personal value and directedness) we can only conclude the manipulations were successful.

## **Conclusion**

The findings illustrate the importance that performing arts can perform for strengthening social ties in society. Beyond the arts, however, the research also attests to the sensitivity of humans in interpreting and internalizing the social interactions that occur in their immediate environment. This very basic ability to “read” other people’s social interactions, and to internalize it into one’s own psychological relations, may play a key role in a broad range of social phenomena. For instance, these principles are likely to operate in the psychological experience not just of (dance) performances, but also festivals, demonstrations, sports events, parades, collective rituals, etc. At a more fundamental level,

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<sup>22</sup> Descriptive statistics from these measures can be found in the supplementary material.

these principles may also explain how it is possible for humans to experience strong bonds with groups that they are not an active part of: the passive bystander's experience of solidarity with a small band of actors.

We have shown that observers internalize the solidarity displayed by actors on stage. Thus, solidarity between an interacting target group is transferred upon non-participating and inactive observers. This means that in some sense, the target group's boundaries become psychologically permeable; group growth is not only a product of actual interaction with a group or of self-categorization, but can also be a product of observing the solidarity of a group and internalizing it. In sum, social gatherings where performers and spectators come together cannot just enhance feelings of solidarity: they can shape the formation of new communities.

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Table 1

*Experiment 1: Mean and standard deviation for all measurements per condition*

	Condition		
	Individuals	Mechanical	Organic
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Perceived entitativity	3.82 (1.70)	5.62 (1.21)	5.60 (1.10)
Perceived personal value	4.45 (1.52)	4.65 (1.33)	5.00 (1.15)
Dancers were directed	4.70 (1.42)	5.37 (1.22)	4.56 (1.47)
Solidarity with the dancers	3.12 (1.41)	3.47 (1.38)	3.70 (1.45)
Identification with all dancers equally	2.50 (1.43)	3.45 (1.88)	3.41 (1.60)
Solidarity among the audience	3.24 (1.37)	3.27 (1.54)	3.00 (1.26)
Solidarity between audience and dancers	2.89 (1.29)	3.07 (1.27)	2.97 (1.16)
Evoked interest	3.90 (1.39)	4.60 (1.41)	4.58 (1.39)
Cultural behaviour	3.87 (1.44)	4.26 (1.48)	4.03 (1.23)



Table 2

*Experiment 2: Mean and standard deviation for all measurements per condition*

	Condition		
	Individuals	Mechanical	Organic
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Perceived entitativity	5.06 (1.41)	5.59 (1.06)	5.66 (1.03)
Perceived personal value	4.25 (1.61)	4.04 (1.37)	4.79 (1.36)
Solidarity with the dancers	3.59 (1.44)	4.33 (1.29)	4.28 (1.41)
Closeness audience and dancers	2.84 (1.24)	3.68 (1.33)	3.36 (1.41)
Artistic evaluation	4.17 (1.49)	4.94 (1.17)	5.08 (1.07)
Cultural behaviour	4.17 (1.29)	4.17 (1.38)	4.20 (1.23)

Table 3

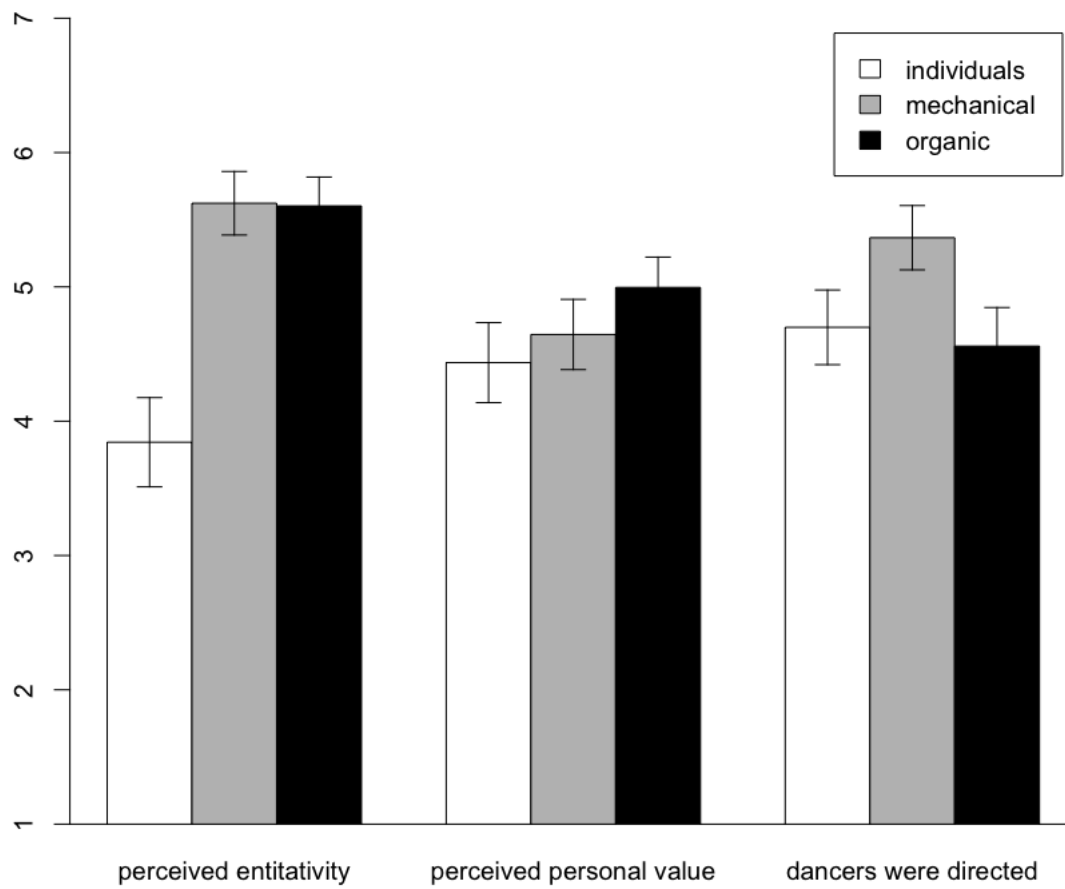
*Experiment 2a: Mean and standard deviation per condition for the number of words used in the answer to the open question about feelings evoked by the performance*

	condition		
	Individuals	Mechanical	Organic
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Positive	0.61 (0.76)	1.17 (0.94)	0.99 (0.95)
Negative	1.62 (1.00)	1.12 (1.05)	0.83 (1.05)
Arousal	1.95 (1.17)	2.00 (1.30)	1.58 (1.25)
Structure	0.01 (0.10)	0.15 (0.41)	0.07 (0.26)
Chaos	0.30 (0.52)	0.19 (0.48)	0.11 (0.34)
Social	0.19 (0.39)	0.44 (0.70)	0.59 (0.84)

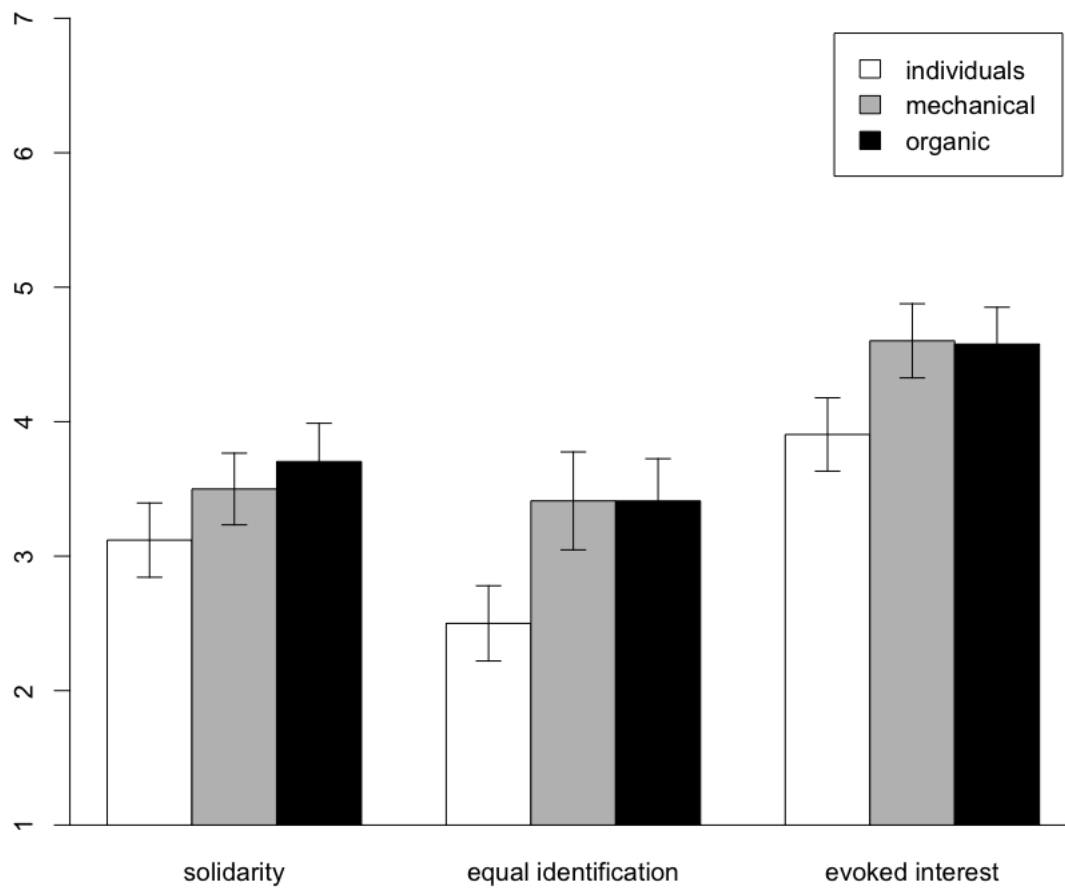
Table 4.

*Experiment 3: Mean and standard deviation for all measurements per condition*

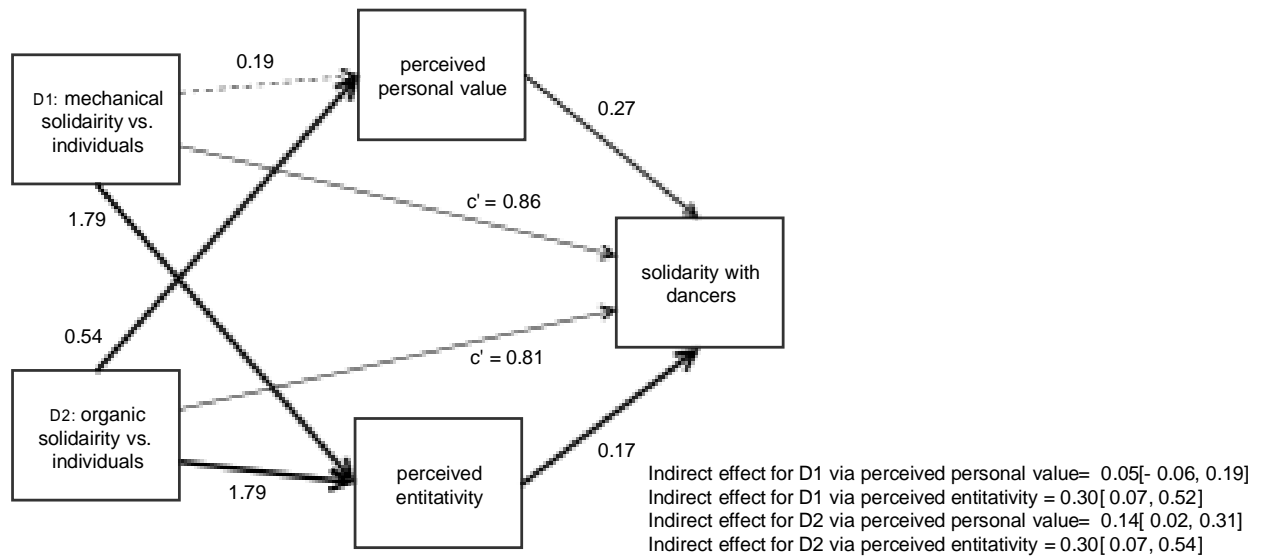
	condition					
	individuals		mechanical		organic	
	<i>M</i>	( <i>SD</i> )	<i>M</i>	( <i>SD</i> )	<i>M</i>	( <i>SD</i> )
Perceived entitativity	4.69	(1.63)	5.47	(1.16)	5.65	(1.14)
Perceived personal value	4.63	(1.39)	4.53	(1.43)	5.76	(0.99)
Directed	4.37	(1.34)	4.69	(1.17)	4.82	(1.21)
Solidarity with the performers	2.39	(1.44)	3.11	(1.24)	3.59	(1.55)
Solidarity among the audience	3.47	(1.42)	3.33	(1.30)	3.44	(1.39)
I felt unpleasant, not at ease, uncomfortable - pleasant, at ease, comfortable	3.06	(1.59)	3.88	(1.62)	4.50	(1.82)
The dancers were unpleasant, not at ease, uncomfortable - pleasant, at ease, comfortable	3.13	(1.92)	4.21	(1.75)	4.67	(1.59)
Evaluation of the performance	4.09	(1.47)	4.51	(1.25)	5.56	(1.00)
Evoked interest	3.21	(1.68)	3.46	(1.60)	4.30	(1.58)
Artistic evaluation [aggregated]	3.65	(1.46)	3.98	(1.30)	4.93	(1.24)



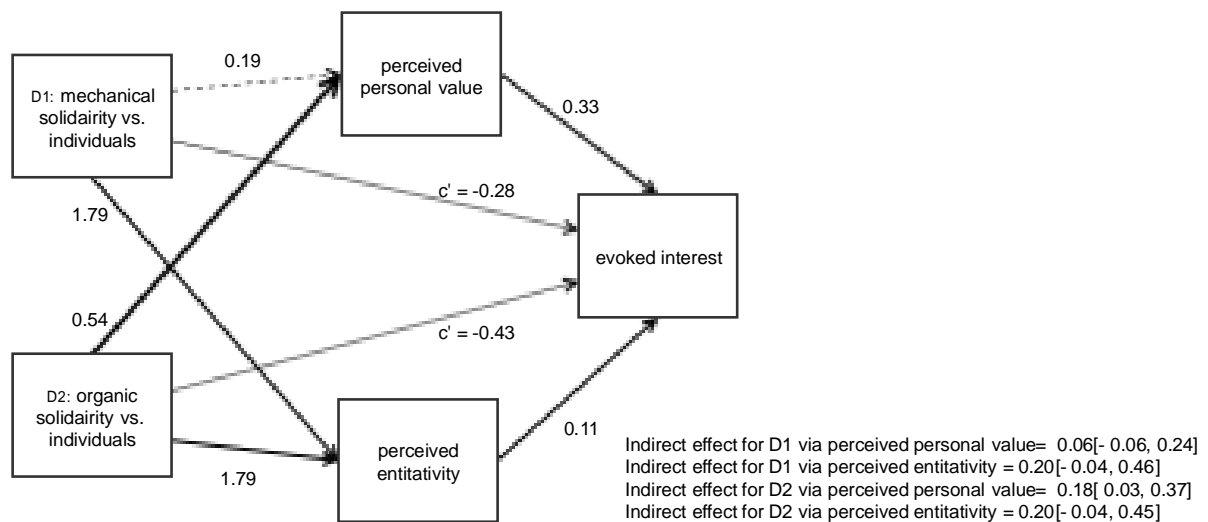
*Figure 1.* Experiment 1: Means and 95% confidence interval for the perception of the performance per condition.



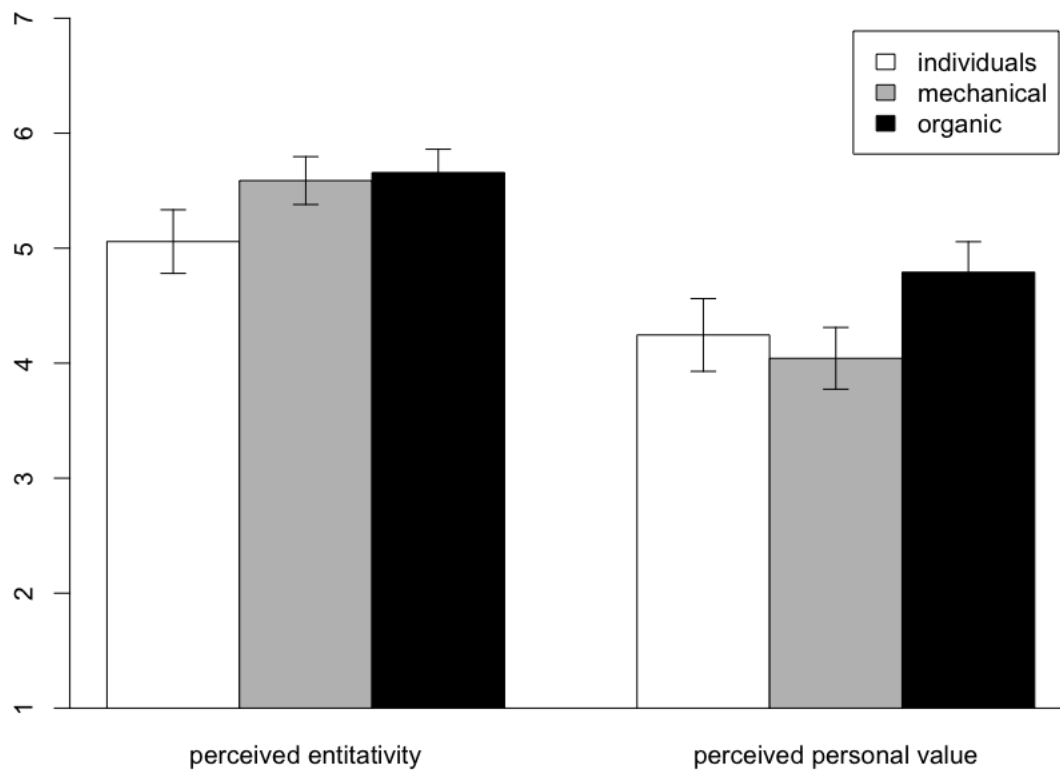
*Figure 2.* Experiment 1: Mean and 95% confidence interval for the solidarity with the dancers and evoked interest per condition.



*Figure 3.* Experiment 1: Mediation model showing the relationship between mechanical vs. individuals (D1) and solidarity with the dancers and organic vs. individuals (D2) and solidarity with the dancers, mediated by perceived personal value and perceived entitativity (within group effects are shown). The correlation between the mediators was  $r = .40$ ,  $p < .001$ .

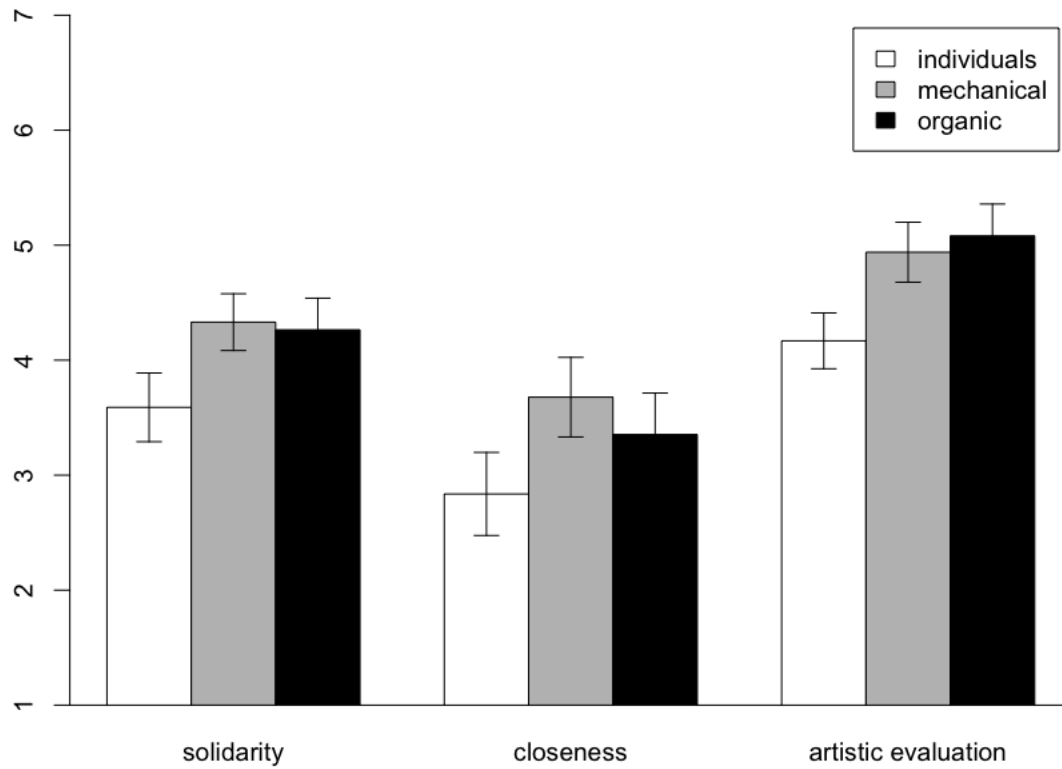


*Figure 4.* Experiment 1: Mediation model showing the relationship between mechanical vs. individuals (D1) and evoked interest and organic vs. individuals (D2) and evoked interest, mediated by perceived personal value and perceived entitativity (within group effects are shown). The correlation between the mediators was  $r = .40$ ,  $p < .001$ .

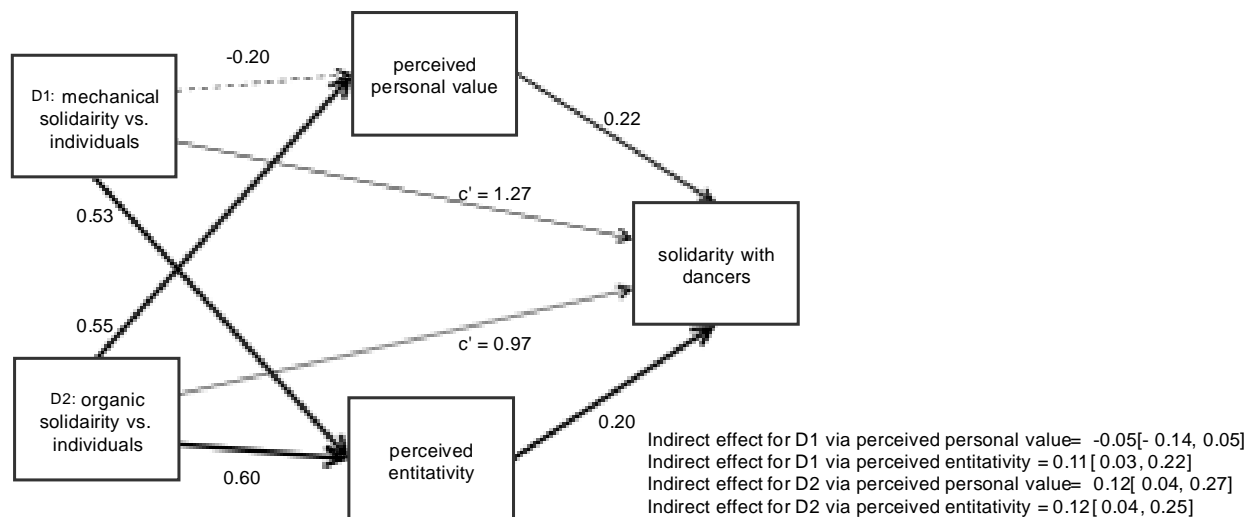


*Figure 5.* Experiment 2a: Mean and 95% confidence interval for perception of the performance per condition.

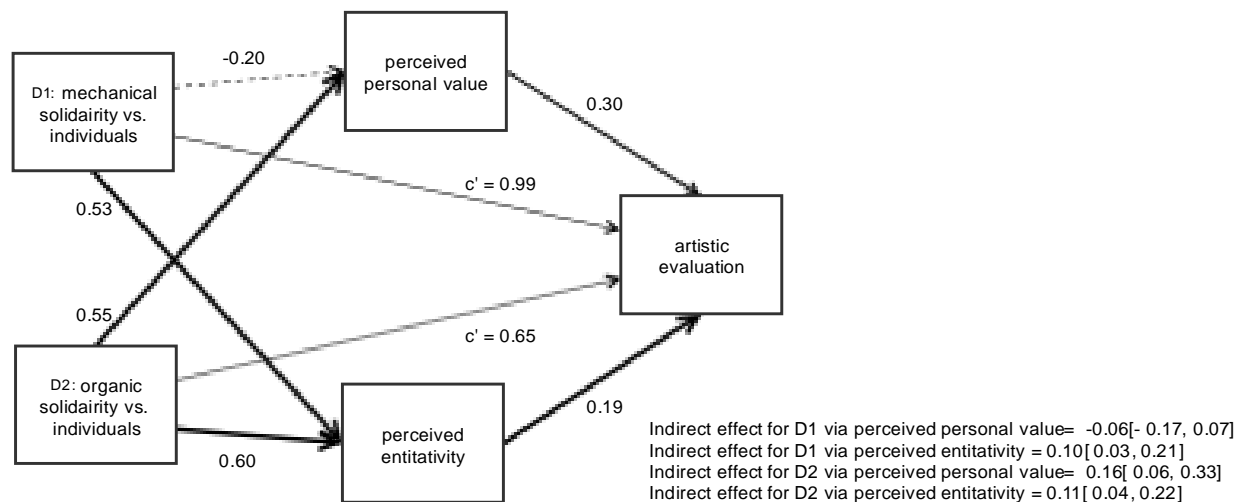




*Figure 6.* Experiment 2a: Mean and 95% confidence interval for solidarity with the dancers, closeness between audience and dancers, and artistic evaluation of the performance.



*Figure 7.* Experiment 2a: Mediation model showing the relationship between mechanical vs. individuals (D1) and solidarity with the dancers and organic vs. individuals (D2) and solidarity with the dancers, mediated by perceived personal value and perceived entitativity (within group effects are shown). The correlation between the mediators was  $r = .25$ ,  $p < .001$ .



*Figure 8.* Experiment 2a: Mediation model showing the relationship between mechanical vs. individuals (D1) and artistic evaluation and organic vs. individuals (D2) and artistic evaluation, mediated by perceived personal value and perceived entitativity (within group effects are shown). Unstandardized path coefficients are shown; the coefficients between the parentheses are the path coefficients controlling for the mediators. The correlation between the mediators was  $r = .25$ ,  $p < .001$ . Note: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

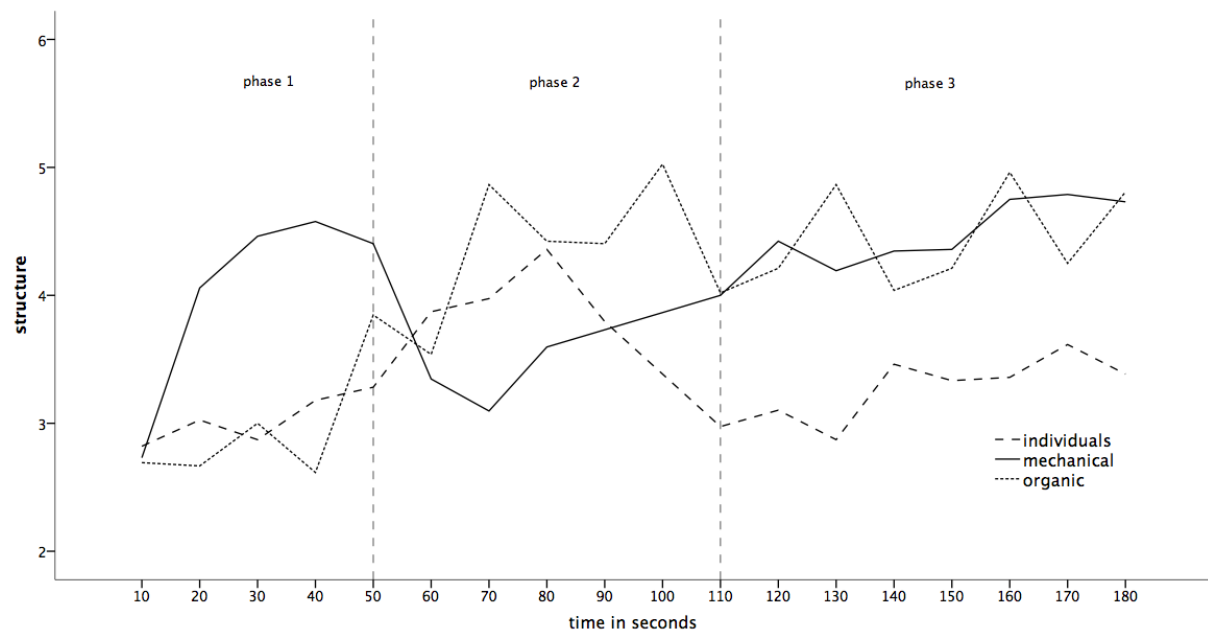
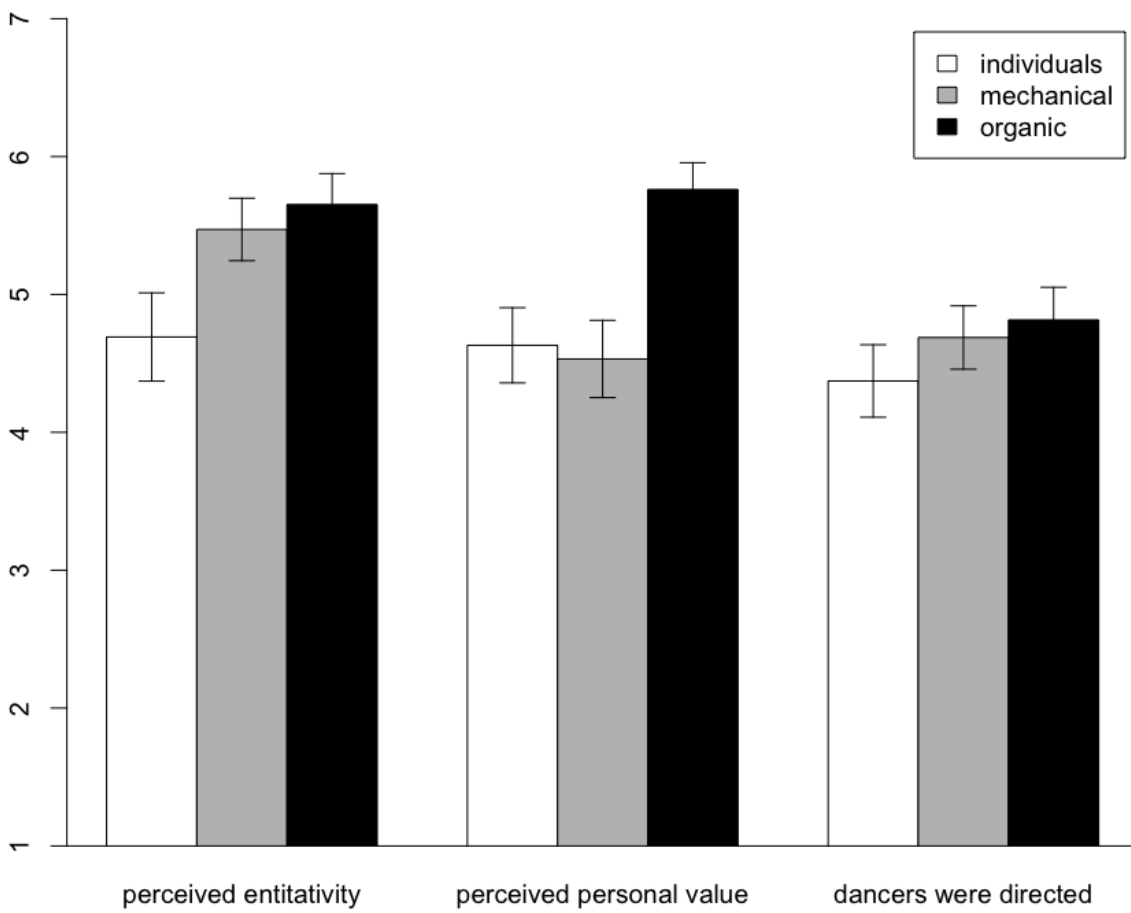
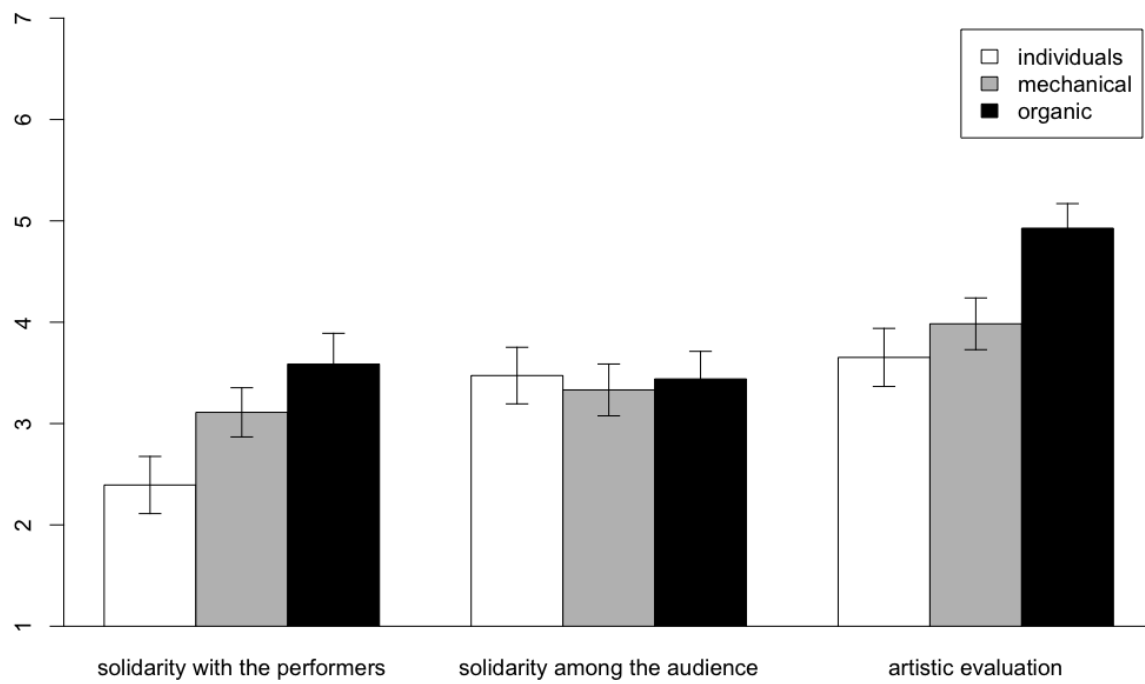


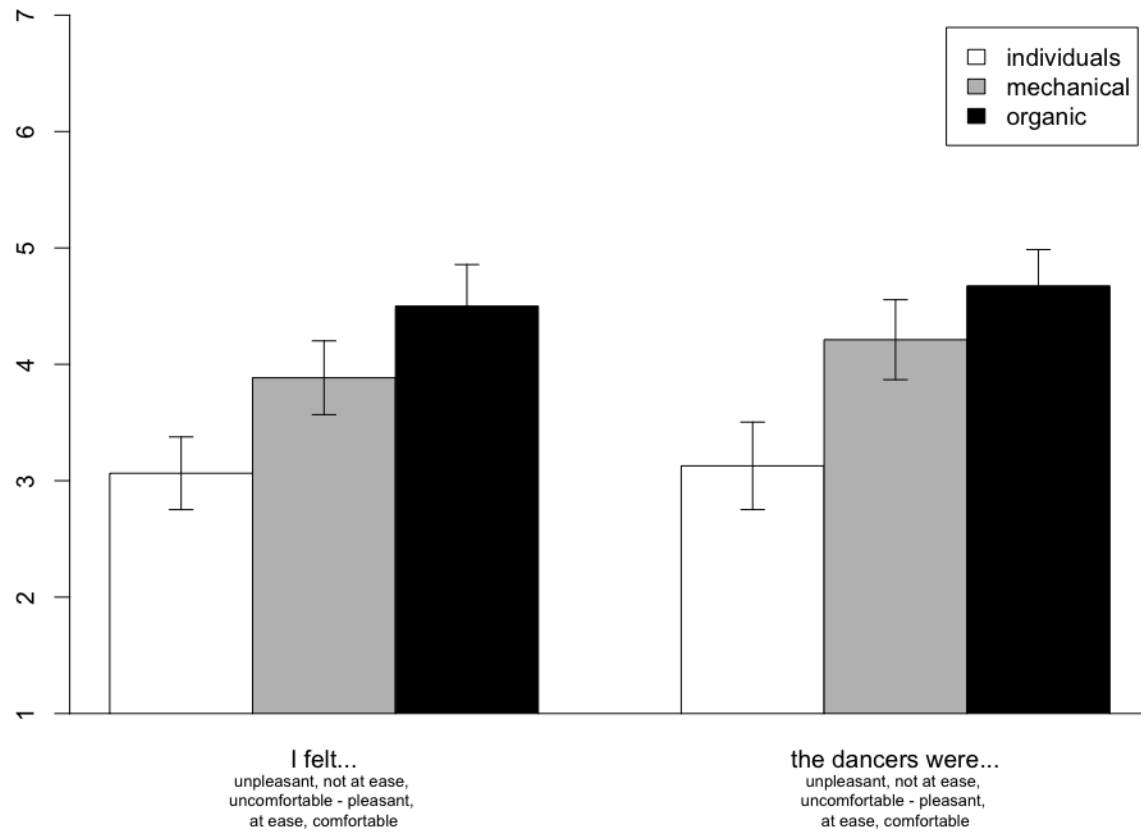
Figure 9. Experiment 2b: Structure over time during first three minutes of the task aggregated per condition.



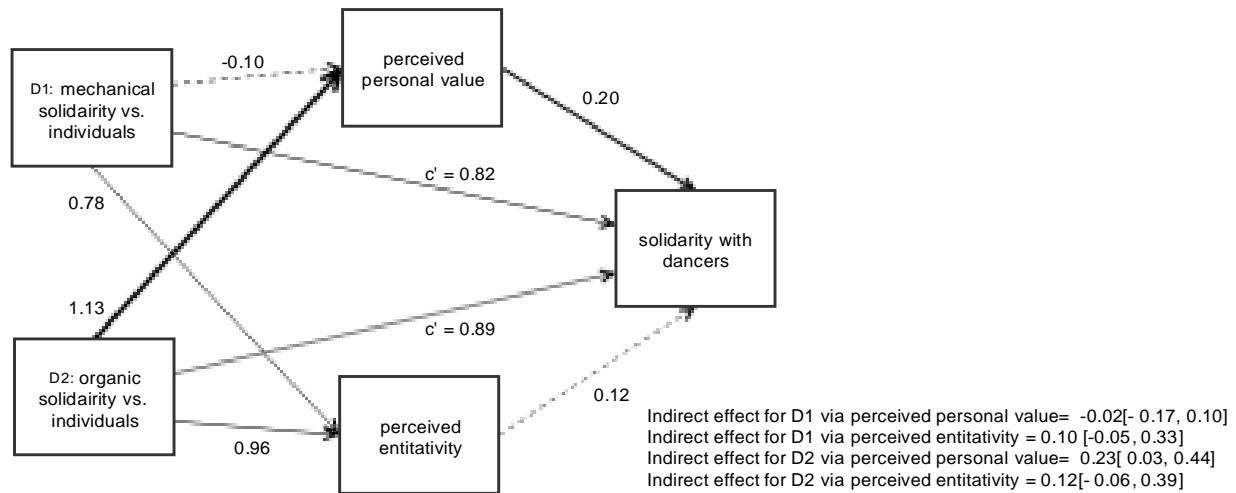
*Figure 10.* Experiment 3: Means and 95% confidence interval for the perception of the performance per condition.



*Figure 11.* Experiment 3: Mean and 95% confidence interval for the solidarity with the dancers, solidarity among the audience, and artistic evaluation per condition.

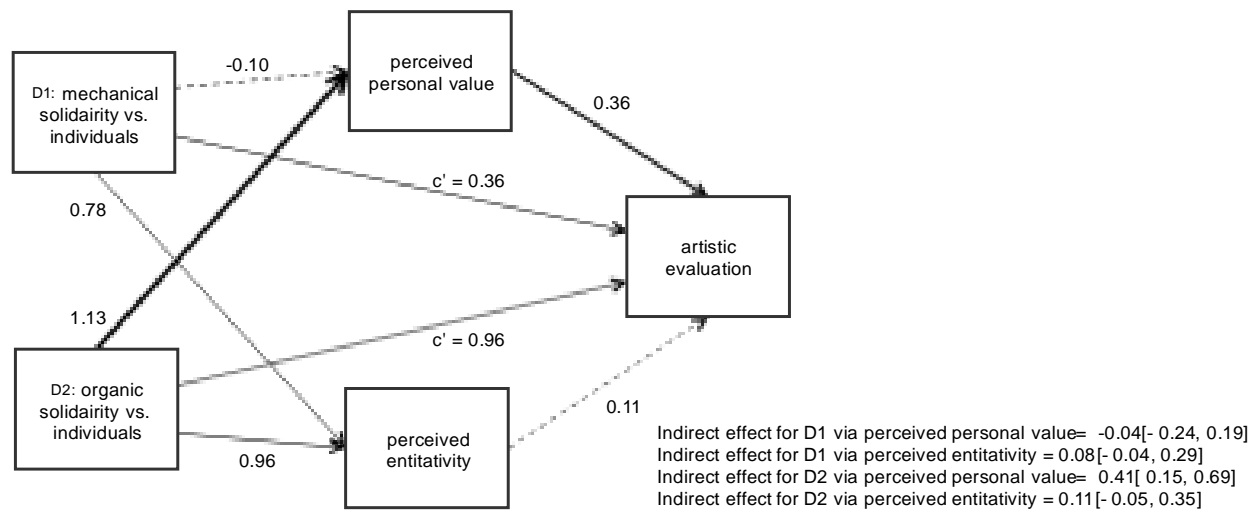


*Figure 12.* Experiment 3: Mean and 95% confidence interval for affect, appraisal and attitude of pleasantness per condition.



*Figure 13.* Experiment 3: Mediation model showing the relationship between mechanical vs. individuals (D1) and solidarity with the dancers and organic vs. individuals (D2) and solidarity with the dancers, mediated by perceived personal value and perceived entitativity (within group effects are shown). The correlation between the mediators was  $r = .21$ ,  $p = .012$ .





*Figure 14.* Experiment 3: Mediation model showing the relationship between mechanical vs. individuals (D1) and artistic evaluation and organic vs. individuals (D2) and artistic evaluation, mediated by perceived personal value and perceived entitativity (within group effects are shown). The correlation between the mediators was  $r = .21$ ,  $p = .012$ .